

# FINAL ENVIRONMENTAL IMPACT STATEMENT

for the  
Proposed

## Piñon Pine Power Project

Tracy Station, Nevada



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U.S. DEPARTMENT OF ENERGY

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The piñon pine (*Pinus monophylla*) is an integral part of the natural western high desert landscape. This single-leaf tree with its bluish green hue can be found on the horizon of all 17 Nevada counties. The hardy species has survived the poor soils and minimal rainfall of the rough desert terrain over the centuries to become the official Nevada state tree.

# COVER SHEET

September 1994

## LEAD AGENCY

U.S. Department of Energy (DOE)

## TITLE

*Final* Environmental Impact Statement for the Proposed Piñon Pine Power Project; Tracy Station, Nevada (NV)

## CONTACT

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## ABSTRACT

The U.S. Department of Energy (DOE) has prepared this FEIS to assess environmental and human health issues and to determine potential impacts associated with the Piñon Pine Power Project, a proposed 104 MW (gross) demonstration project located near Reno, NV, that would be cost-shared between the DOE and the Sierra Pacific Power Company (SPPCo.) under the Clean Coal Technology (CCT) Program. The proposed project would demonstrate unique features of Integrated Gasification Combined-Cycle (IGCC), a technology that converts coal into clean gas virtually free of sulfur and particulates, burns the gas in a combustion turbine to generate electricity, and then captures the heat to drive a steam turbine, which generates additional electricity. The proposed Piñon Pine Power Project would utilize the KRW fluidized-bed gasification process, operating in the air-blown mode with in-bed desulfurization and hot gas cleanup technology and would demonstrate that IGCC power plants based on this technology could be built cost effectively, with thermal efficiencies that would significantly reduce electric power costs over more conventional technologies. The project also would demonstrate the effectiveness of hot gas cleanup in reducing environmental impacts. The proposed project would be located at SPPCo.'s Tracy Power Station, a power generation facility located on a rural 724-acre plot about 27.4 km (17 miles) east of Reno, NV. DOE's participation in the project would last approximately 96 months, including design, approximately 26 months of construction, and a 42-month demonstration period. The demonstration is expected to generate valuable data for assessing plant reliability and performance and would be an important step leading to widespread commercial application of IGCC technology.

*Following the issuance of the Draft Environmental Impact Statement to the public, several changes were introduced by SPPCo. modifying the design of the proposed project. Most of the changes are associated with air emissions from the proposed project, the most appreciable of which is the decrease in the height of the primary stack from 91 meters (300 feet) to 68.5 meters (225 feet). This change followed a modification in the initial design of the coal storage area. This and other design modifications resulted in changes in the maximum ambient ground-level emissions concentrations that had been predicted in the Draft EIS. Although specific aspects of the project have changed, the overall description of the proposed Federal action remain the same. These changes have been identified in the document and the resulting impacts have been analyzed. DOE has reviewed these changes and*

***found that these project design modifications are not substantial changes relevant to environmental impacts and that a Supplement to the Draft EIS is not required.***

Environmental impacts from the construction and operation of the proposed Piñon Pine Power Project are evaluated *in this FEIS*. Detailed analyses focus on the level of impacts that could be expected in air quality, water quality and quantity, and on the endangered Cui-ui fish species. Other areas of analyses include the disposal of LASH (spent limestone and coal ash mixture), noise, and engineering requirements for construction based on site geology considerations. This *FEIS* also examines land use, aesthetics, cultural resources, and health and safety programs. Impacts to socioeconomic resources and public services also are discussed. Mitigation measures *considered necessary* for the proposed action include: vegetative plantings to screen portions of the proposed facility; the suppression of fugitive dust emissions during construction; coordination with the Nevada Department of Transportation related to safety measures or improvements during fog events; habitat enhancement; the protection of archaeological sites; and the temporary relocation of people (on a voluntary basis) residing in the area who may be affected by noise during steam blowing. ***In response to public comments, the evaluation of air emissions control options and dry cooling technology have been added to the final statement as mitigation options that were considered to address air emissions and water conservation concerns.*** In addition to the proposed action, the *FEIS* considers the no-action alternative. For the no-action alternative, DOE would not provide cost-shared funding support for the proposed Piñon Pine Power Project. In this case, SPPCo.'s most reasonable course of action likely would be the construction of essentially the same project, but without the capability of using coal fuel. Their project would use natural gas with distillate oil as a secondary fuel source. The level of impacts resulting from the no-action alternative would be similar to those of the proposed action. Air quality impacts would be less and solid waste generation would be reduced; however, the socioeconomic benefits associated with the no-action alternative would not be as great as those that probably would result from the proposed action.

## **AVAILABILITY**

The *FEIS* is available for public inspection in the following public reading rooms.

- U.S. Department of Energy, Freedom of Information Public Reading Room, Room 1E-190, 1000 Independence Ave., SW, Washington, DC 20585. Tel. (202) 586-6020
- Lyon County Fernley Branch Library, P.O. Box 647, 575 Silverlace Blvd., Fernley, NV 89408. Tel. (702) 575-2550
- Washoe County Public Library, Government Documents Section, 301 South Center Street, Reno, NV 89502. Tel. (702) 785-4190
- Storey County Library, 95 South R Street, Virginia City, NV 89440-0014. Tel. (702) 847-0956
- Mr. Matt Marsteller - LIBRARY, U.S. Department of Energy, Morgantown Energy Technology Center, 3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507-0880. Tel. (304) 291-4183
- Sierra Pacific Power Company, 6100 Neil Rd., Reno, NV 89511. Tel. (702) 689-4011

## **PUBLIC COMMENTS**

DOE encourages public participation in the National Environmental Policy Act (NEPA) process. Accordingly, public scoping meetings were held at the Pyramid Lake Paiute Indian Tribal Council Chamber in Nixon, NV, on Tuesday, July, 21, 1992; at the Lyon County Branch Library in Fernley, NV, on Wednesday, July 22, 1992; and at the City of Reno Council Chambers in Reno, NV, on Thursday, July 23, 1992. The public was invited to provide oral comments at the scoping meetings and to submit additional comments in writing to DOE by the close of the scoping period on August 7, 1992. In preparing the DEIS, DOE considered both oral and written comments. *Public hearings on the DEIS were held at the Pyramid Lake Paiute Indian Tribal Council Chamber in Nixon, NV, on June 21, 1994; at the Rainbow Bend Country Club in Storey County, NV, on June 22, 1994; and at the University of Reno in Reno, NV, on June 23, 1994. The public was invited to provide oral comments at these hearings and to submit written comments to DOE by the close of the public comment period on July 23, 1994. In preparing the FEIS, DOE considered 181 oral and written comments. Copies of the comments are provided in Appendix I of this document; responses are provided in Appendix J. All communication should be sent to the contact person identified above.*

*All changes in this FEIS, including correcting typographical errors, making grammatical improvements, and further clarifying information from the Draft EIS are indicated with bold italics type. One new appendix has been inserted between existing appendices; it is designated as Appendix D1 (Fogging Potential Analysis) to avoid the need for re-designation of subsequent appendices and all cross-references throughout the document. Additional tables and figures have been similarly designated. Two appendices have been added to the end of the document: Appendix I contains reproductions of all comments as submitted; Appendix J contains the responses to these comments. Since publication of the Draft EIS, SPPCo. has made some design changes, which are summarized in the Executive Summary. These changes are discussed in detail in the FEIS and the resulting impacts are incorporated into the analyses of consequences.*

CHANGES TO THE DRAFT EIS  
ARE SHOWN IN  
A **BOLDFACE ITALICS** FONT

## EXECUTIVE SUMMARY

This *Final* Environmental Impact Statement (*FEIS*) has been prepared by the U.S. Department of Energy (DOE) in compliance with the National Environmental Policy Act (NEPA) to assess the environmental and human health issues associated with the Piñon Pine Power Project, a proposed demonstration project that would be cost-shared by DOE and the Sierra Pacific Power Company (SPPCo.) under DOE's Clean Coal Technology (CCT) Program. The goal of the CCT Program, a planned \$5 billion national commitment, is to demonstrate advanced coal utilization technologies that are energy efficient and reliable and that are able to achieve substantial reductions in emissions as compared with existing coal technologies.

The proposed Federal action is for DOE to provide cost-shared funding support for the construction and operation of the Piñon Pine Power Project, a coal-fired power generating facility, which would be a nominal, 800-ton-per-day (104 megawatt (MW) gross generation) air-blown, Integrated Gasification Combined-Cycle (IGCC) plant proposed by SPPCo. at its Tracy Power Station near Reno, NV. The overall purpose of the proposed project is to demonstrate that IGCC technology is cost-effective and can reduce emissions of sulfur dioxide (SO<sub>2</sub>), oxides of nitrogen (NO<sub>x</sub>), and particulates (PM<sub>10</sub>). SPPCo. has entered into a contract agreement with Foster Wheeler USA Corporation (Foster Wheeler) for the project. In addition, The MW Kellogg Company (Kellogg) would be a subcontractor for the design of a key part of the IGCC system (i.e., the KRW fluidized-bed gasification process).

DOE determined that providing cost-shared funding support for this proposed project constitutes a major Federal action that may significantly affect the human environment. Consequently, the Department has prepared this *FEIS* to assess potential impacts on the affected human and natural environments. This document has been prepared in accordance with section 102(2)(c) of the National Environmental Policy Act (NEPA) as implemented under regulations promulgated by the President's Council on Environmental Quality (CEQ) (40 CFR Parts 1500-1508), and as provided in DOE regulations for implementing NEPA (10 CFR Part 1021).

This *FEIS* represents the third and final element of DOE's overall NEPA strategy developed for the CCT Program. The first element involved the preparation of a comprehensive Programmatic Environmental Impact Statement (PEIS), published in November 1989 (DOE/EIS-0146). The second element involved conducting a pre-selection, project-specific, environmental review of proposed projects for each of five separate solicitations. This *FEIS* considers the proposed action (DOE funds the project

as proposed) and the no-action alternative (DOE does not fund the project). Other alternatives to the proposed action (e.g., alternative sites, alternative projects) are discussed but are not analyzed in detail.

A detailed description of existing conditions at the proposed site and the surrounding area is provided in this document. Potential impacts from the construction and operation of the proposed Piñon Pine Power Project, as well as from the most reasonable course of action resulting from the no-action alternative, are compared against this baseline. Potential impacts to aesthetics, air quality, geology and soils, surface water and groundwater, land use, socioeconomic resources, and environmental *justice*, threatened and endangered species, aquatic and terrestrial habitats, biodiversity, cultural resources, health and safety, hazardous and toxic materials/waste management, pollution prevention, and noise are analyzed. During the scoping process, specific key issues were identified, including the impact from increasing water withdrawals from the Truckee River at the Tracy Station site; the impact to the Cui-ui, an endangered species of sucker fish; and the impact to air quality from coal-fired plant emissions.

Construction of the proposed action would be at SPPCo.'s Tracy Power Station, which consists of three steam generating units fired on either natural gas or number 6 fuel oil producing 53 MW, 83 MW, and 108 MW, respectively; two combustion turbines fired on number 2 distillate fuel oil; and two additional 83.5 MW simple-cycle combustion turbine generating units and auxiliary equipment that *have recently been* installed to supply 167 MW (net) of electrical power. The support facilities required for the proposed project would include coal and limestone storage and handling, ash handling and disposal, cooling water supply, control rooms, and other infrastructures. Construction activities would include building an additional evaporation pond, installing propane gas storage tanks, and modifying existing transportation facilities.

*Following the issuance of the Draft EIS to the public in May 1994, several changes were introduced by SPPCo. as part of their continuing efforts to refine the design of the proposed project. These changes are discussed in detail in the Final EIS and resulting impacts are incorporated into the analyses of consequences. The table presented on the next page indicates the more appreciable changes that have occurred. Most of the changes are associated with air emissions from the proposed project. The primary change is the decrease in height of the primary stack from 91 meters (300 feet) to 68.5 meters (225 feet). This change is aimed at reducing the cost for stack construction and is consistent with a change in the coal storage area from an initial design of two silos that were 61 meters (200 feet) high to a revised design of a single domed silo that would be only 23 meters (75 feet) high. Other changes include decreasing the exit temperature of the exhaust gas streams in the two flues of the*

*Engineering design changes in proposed project since publication of the DEIS.*

<i>Facility</i>	<i>Change from DEIS to FEIS</i>	<i>Reason</i>
<i>CT/HRSG, Sulfation Combustor</i>	<i>Reduction of stack height from 91 meters (300 feet) to 68.5 meters (225 feet)</i>	<i>Reduced cost for stack construction</i>
	<i>Change in exhaust gas temperature and exit velocity</i>	<i>Refinement in engineering analysis</i>
<i>Coal Dryer, Material Storage Silos, Coal Unloading Area</i>	<i>Relocation of sources (approximately 79 to 110 meters (260 to 360 feet) to the northwest)</i>	<i>Refinement in plant layout to reduce cost for conveyor systems, accommodate efficient site grading</i>
<i>Cooling Tower</i>	<i>Reduction in PM<sub>10</sub> emission rate</i>	<i>Refinement of initial estimate of tower drift rate</i>
	<i>Relocation of source (approximately 230 meters (754 feet) to the northwest)</i>	<i>Refinement in plant layout to accommodate efficient site grading</i>
<i>Coal Prep Area</i>	<i>Reduction in PM<sub>10</sub> emission rate</i>	<i>Relocation of gasifier feed vent (previously included in coal preparation area emissions)</i>
<i>Coal Storage</i>	<i>Reduction in height of storage facility from 61 meters (200 feet) to 23 meters (75 feet) and relocation of source (approximately 251 meters (823 feet) to the northwest)</i>	<i>Modification of single coal storage dome to reduce cost and improve overall plant efficiency</i>
<i>Gasifier Feed Vent, Sulfator, Depressurization Vent, Sorbent Storage Vent</i>	<i>Addition of minor particulate sources (less than 0.1 g/s)</i>	<i>Addition of depressurization vents to accommodate equipment design considerations</i>
<i>Wastewater Cooling Tower</i>	<i>Addition of minor particulate sources (emissions less than 0.1 g/s)</i>	<i>Addition of wastewater cooling tower to reduce size and cost of evaporation pond</i>
<i>Evaporation Pond</i>	<i>Reduction in pond size</i>	<i>Addition of wastewater cooling tower reduced required pond size and cost of pond construction</i>

*primary stack, modifying the exit velocity of the two flue gas streams, decreasing particulate emissions from the cooling tower, reconfiguring the sources of particulate emissions in the coal preparation area, and relocating several of the proposed ancillary facilities. DOE has reviewed these changes and found that they are not substantial changes relevant to environmental concerns. Thus, a Supplement to the Draft EIS, in accordance with 40 CFR 1502.9(c), is not required.*

Additional structures added to the existing site would not alter visual quality. Air quality impacts from construction activities would be temporary. Since the site is zoned for industrial use, there would be no impact to land use; however, a Special Use Permit would be required. Short-term impacts resulting from blowing dust during construction may be expected; a spill and erosion control plan would be implemented to preclude impacts to aquatic ecosystems.

Air emissions expected during operation of the proposed facility include SO<sub>2</sub>, PM<sub>10</sub>, NO<sub>x</sub>, and carbon monoxide (CO). Modeling results indicated that pollutant emission levels would be in compliance with the National Ambient Air Quality Standards (NAAQS) and would not have a significant impact on nonattainment areas in the Truckee Meadows. Emissions of sulfur oxides (SO<sub>x</sub>) and NO<sub>x</sub> would be below foliar threshold values. Both the Class I and Class II Prevention of Significant Deterioration (PSD) increment analyses indicate that the proposed project would not result in significant degradation of air quality. *Site-specific analyses for Nixon and Wadsworth areas show that no adverse air quality impacts would occur on tribal lands.* Results of a visibility analysis indicate that visual impacts would be below the screening criteria for all impact categories. Some increase in the production of fog in the canyon could be expected during cold weather; however, warning signs currently are posted along I-80, and SPPCo. would continue to work with the Nevada Department of Transportation (NDOT) to determine if additional measures would be needed.

Both construction and operation of the proposed plant could impact surface water, groundwater, and the water table of the surrounding area. Water use during construction would differ little from present practices; runoff from construction activities would be directed to the cooling pond; best management practices (BMPs) would be implemented to control nonpoint sources of pollution; and withdrawal of groundwater during construction is not expected to increase. River water quality would not be impacted by operation because the plant would continue as a "zero discharge" system. The increase in water consumption would be relatively small. Downstream users would experience a water loss of approximately 1,000 acre-feet per year or 1.4 cubic feet per second (cfs) (typically less than 1 percent of current normal Truckee River flows). The endangered Cui-ui sucker and threatened Lahontan

cutthroat trout are the two fish species potentially affected by changes in water diversion at the project site; however, neither species is present in the vicinity of the project. The Cui-ui Recovery Plan assumes full use of SPPCo.'s existing water rights; therefore, the proposed project would have no impact on the implementation of the Cui-ui Recovery Plan.

Some wildlife and vegetation would be permanently displaced because of grading and compaction, while others would be temporarily affected because of construction noise and activity. The U.S. Fish and Wildlife Service (USFWS) has concurred with the opinion that *the proposed project would have no effect on* threatened and endangered species.

No significant adverse socioeconomic impacts are anticipated to be associated with the proposed project. Adequate labor force, housing, schools, police protection, fire protection, and medical services are available. A beneficial impact of increased tax revenue is expected. No adverse impacts would occur to minority or low-income communities. No impacts to Native American cultural resources are expected. The location of the Piñon Pine Power Project's facilities would not disturb historical or archaeological sites; this would be ensured by installing fences to prevent intrusion.

LASH (the spent limestone and coal ash mixture removed from the gasifier unit) constitutes the major solid waste that would be generated under the proposed action. Options for disposal of LASH are being investigated. If LASH were to be disposed in the Lockwood landfill, the disposal could potentially reduce the 122-year lifespan of the landfill by 2 years.

Mitigation measures that have been identified *as necessary* for the proposed action include: vegetative plantings on the south bank of the Truckee River to screen portions of the proposed facility; use of earth-tone painting of structures, where appropriate; suppression of fugitive dust emissions during construction by water application, as necessary; coordination with the NDOT to lessen safety impacts during fog episodes; preparation of a geotechnical report to identify mitigation measures that may be necessary to ensure proper foundation stability; *implementation of a soil resistivity program for use in the design of underground features*; water quality testing of the evaporation pond to indicate the need for mitigation; habitat enhancement for Mule deer through the planting of food sources; protection of untested archaeological sites by chain-link fences; and notification and temporary relocation on a voluntary basis of people residing in the area who are potentially affected by short noise episodes related to steam blowing during the construction phase. *In response to public comments, mitigation measures,*

*which have been considered have been added. An analysis of cooling options and an analysis of air emissions control options have been included in the FEIS in the mitigation section.*

The no-action alternative would result if DOE does not provide cost-shared funding support for the proposed Piñon Pine Power Project. Under the no-action alternative, the advanced KRW gasification technology with hot gas cleanup probably would not be demonstrated at the Tracy Station, NV, site, and probably would not be demonstrated elsewhere because there are no similar proposals in the CCT Program. The opportunity to demonstrate this particular technology likely would be lost. Commercialization of the proposed technology at best would be delayed or eliminated, and the opportunity for utilities and private industry to select this particular clean coal technology with its potential for lowering SO<sub>2</sub> and NO<sub>x</sub> emissions nationwide may be lost.

*Under the no-action alternative, it is reasonably foreseeable that SPPCo. would find another cost-effective option to meet the projected energy consumption of its customers by adding generating capacity. The "most reasonable" course of action for SPPCo. to pursue would likely be the construction of essentially the same project at the same site, but without the capability of using coal fuel. This project would use natural gas with distillate oil as a secondary fuel source. A final technology alternative and fuel-source determination would be made by SPPCo. in compliance with the resource planning process required by the state of Nevada.*

Impacts from both the proposed action and the no-action alternative would be similar for most resources. However, air emissions from the no-action alternative would be less than for the proposed action because the anticipated use of natural gas would result in lower emissions of SO<sub>2</sub>, PM<sub>10</sub>, NO<sub>x</sub>, and CO. *In addition, water consumption for the no-action alternative would be approximately two-thirds that of the proposed action.* Because the most likely project that would result *under* the no-action alternative would be *non*-coal-burning, no LASH would be generated and thus the potential 2-year reduction in the 122-year lifespan of the Lockwood disposal facility would not result. The beneficial impact of increased tax revenue would be less with the no-action alternative because fewer construction workers and employees would be required. Additionally, the proposed action would further the goals of the CCT Program by demonstrating an environmentally superior coal-based power generating technology, which would include the KRW gasifier with in-bed desulfurization, external regenerable sulfur removal, fine particulate filters, and aspects of the combustion and steam turbines for power generation. The no-action alternative would not advance these program goals.

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## LIST OF ABBREVIATIONS/ACRONYMS

AAQS	Ambient Air Quality Standards
ACOE	U.S. Army Corps of Engineers
ADT	Average daily traffic
AIRFA	American Indian Religious Freedom Act
Al <sub>2</sub> O <sub>3</sub>	Chemical symbol for aluminum oxide
ANC	<i>Acid neutralizing capacity</i>
APE	Area of potential effect
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
BACT	Best Available Control Technology
BBN	Bolt, Beranek and Newman, Inc.
BLM	Bureau of Land Management
BMPs	Best Management Practices
BOD	Biochemical oxygen demand
B.P.	Before present
Btu	British thermal unit
C	Chemical symbol for carbon
C <sub>4</sub> H <sub>8</sub> ONH	Chemical symbol for morpholine
Ca	Chemical symbol for calcium
CA	California
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CaCO <sub>3</sub>	Chemical symbol for calcium carbonate
CaO	Chemical symbol for calcium oxide
CAS	Chemical Abstract Service
CaS	Chemical symbol for calcium sulfide
CaSO <sub>4</sub>	Chemical symbol for calcium sulfate
CT	Combustion turbine
CCT	Clean Coal Technology
CEM	Continuous Emission Monitoring
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act

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CFR	Code of Federal Regulations
cfs	Cubic feet per second
cm	Centimeter
cm/sec	Centimeters per second
CO	Chemical symbol for carbon monoxide
CO <sub>2</sub>	Chemical symbol for carbon dioxide
COE	Crude oil equivalent
COS	Chemical symbol for carbonyl sulfide
CTDM	Complex Terrain Dispersion Model
CTDMPLUS	Complex Terrain Dispersion Model Plus Algorithms for Unstable Situations
CWA	Clean Water Act
dB	Decibels
dBA	Decibels as recorded on the A-weighted scale of a standard sound level meter
DC	Direct current
DEIS	Draft Environmental Impact Statement
DHEW	Department of Health, Education, and Welfare
DO	Dissolved oxygen
DOE	U.S. Department of Energy
DRI	Desert Research Institute
E	East
EDTA	Chemical symbol for ethylene diaminetetraacetic acid
EEO	Equal Employment Opportunity
e.g.	For example
EHS	Extremely hazardous substances
EIS	Environmental Impact Statement
EIV	Environmental Information Volume
EMF	Electromagnetic field
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
FAA	Federal Aviation Administration
FAC	Facultative plants
FACU	Facultative upland plants
FACW	Facultative wetland plants
<b><i>FBN</i></b>	<b><i>Fuel-bound nitrogen</i></b>

Fe	Chemical symbol for iron
FEMA	Federal Emergency Management Agency
Fe <sub>2</sub> O <sub>3</sub>	Chemical symbol for ferric oxide
FERC	Federal Energy Regulatory Commission
<b>FGD</b>	<b><i>Flue gas desulfurization</i></b>
FR	Federal Register
ft	Foot
ft <sup>3</sup>	Cubic foot
g	Symbol for acceleration due to gravity
<b>g/s</b>	<b><i>Grams per second</i></b>
gal	Gallon
GE	General Electric
G.O.	General Order
GEP	Good Engineering Practice
gpd	Gallons per day
gpm	Gallons per minute
gvw	Gross vehicle weight
H	Chemical symbol for the hydrogen atom
H <sub>2</sub>	Chemical symbol for hydrogen gas
H <sub>2</sub> O	Chemical symbol for water
H <sub>2</sub> S	Chemical symbol for hydrogen sulfide
H <sub>2</sub> SO <sub>4</sub>	Chemical symbol for sulfuric acid
<b>Ha</b>	<b><i>Hectare</i></b>
HCl	Chemical symbol for hydrochloric acid
HHV	Higher heating value
hp	Horsepower
HRSG	Heat recovery steam generator
Hz	Hertz (measure of frequency in cycles/second)
i.e.	That is
IGCC	Integrated Gasification Combined-Cycle
IGM	Integrated Gaussian Model
IMPLAN	U.S. Department of Agriculture's Forest Service Impact Analysis for Planning Model
in	Inch
ISCST Model	Industrial Source Computer Short-Term Model

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JBR	JBR Consultants Group
kg	Kilogram
km	Kilometer
K <sub>2</sub> O	Chemical symbol for potassium oxide
KRW	KRW Energy Systems, Inc.
kV	Kilovolt
KVAs	Key viewing areas
kWh	Kilowatt hour
L	Liter
L <sub>eq</sub>	Equivalent sound level
L <sub>d</sub>	Day/night noise level
LAER	Lowest Achievable Emission Rate
LASH	A mixture of spent limestone, gypsum and ash
lb	Pound
lb/hr	Pounds per hour
LPG	Liquefied petroleum gas
LHV	Lower heating value
m	Meter
MCE	Maximum credible earthquake
MCLs	Maximum contaminant levels
mg	Milligram
mG	Magnetic field strength
mg/L	Milligram per liter
mgd	Million gallons per day
mg/m <sup>3</sup>	Milligrams per cubic meter
MgO	Chemical symbol for magnesium oxide
mL	Milliliter
ML	Megaliters
mm	Millimeter
mm/yr	Millimeters per year
MM	Modified Mercalli (a 12-point scale used to classify earthquake magnitude)
MMBtu	Million British thermal units
MODFLOW	U.S. Geological Survey finite-difference modular groundwater flow model
MOI	Memorandum of Intent

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mph	Miles per hour
MPTER	Multiple Point-source Gaussian Model
MSDS	Material Safety Data Sheets
MSL	Mean sea level
MW	Megawatt
MWh	Megawatt hours
N	North
N <sub>2</sub>	Chemical symbol for nitrogen
N <sub>2</sub> O	Chemical symbol for nitrous oxide
NA	Not available or Not applicable
NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code
NaCl	Chemical symbol for sodium chloride (common table salt)
Na <sub>2</sub> HPO <sub>4</sub>	Chemical symbol for disodium phosphate
Na <sub>2</sub> O	Chemical symbol for sodium oxide
NaOH	Chemical symbol for sodium hydroxide (commonly known as lye)
NAPAP	National Acid Precipitation Assessment Program
Na <sub>3</sub> PO <sub>4</sub>	Chemical symbol for trisodium phosphate
NDEP	Nevada Division of Environmental Protection
NDF	Nevada Division of Forestry
NDOT	Nevada Department of Transportation
NDOW	Nevada Division of Wildlife
NEPA	National Environmental Policy Act
NEPP	National Energy Policy Plan
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFPA	National Fire Prevention Agency
NH <sub>4</sub> HF <sub>2</sub>	Chemical symbol for ammonium bifluoride
<i>NH<sub>4</sub>HSO<sub>4</sub></i>	<i>Chemical symbol for ammonium bisulfate</i>
<i>(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub></i>	<i>Chemical symbol for ammonium salts</i>
N <sub>2</sub> H <sub>4</sub>	Chemical symbol for hydrazine
NH <sub>3</sub>	Chemical symbol for ammonia
NHPA	National Historic Preservation Act
NIOSH	National Institute for Occupational Safety and Health
NNNPS	Northern Nevada Native Plant Society

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## **Piñon Pine Power Project**

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NO <sub>2</sub>	Chemical symbol for nitrogen dioxide
NO <sub>3</sub>	Chemical symbol for nitrate
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration (U.S. Department of Commerce)
NOI	Notice of Intent (to prepare an EIS)
NOISECALC	Noise modeling model
NO <sub>x</sub>	Chemical symbol for oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRS	Nevada Revised Statutes
NSR	New Source Review
NSPS	New Source Performance Standards
NTU	Nephelometric turbidity units
NV	Nevada
NVNHPP	Nevada Natural Heritage Program
NWI	National Wetlands Inventory
<i>O &amp; M</i>	<i>Operations and maintenance</i>
O <sub>2</sub>	Chemical symbol for oxygen
O <sub>3</sub>	Chemical symbol for ozone
OAQPS	Office of Air Quality Planning and Standards (U.S. Environmental Protection Agency)
OBL	Obligate wetlands plants
OSHA	Occupational Safety and Health Administration
PAH	Polycyclic aromatic hydrocarbons
Pb	Chemical symbol for lead
PCA	Portland Cement Association
PCBs	Polychlorinated biphenyls
PCU	Platinum cobalt units
PEIS	Programmatic Environmental Impact Statement
PG&E	Pacific Gas & Electric
PM	Particulate matter
PM <sub>10</sub>	Particulate matter less than 10 microns in diameter
PO <sub>4</sub>	Chemical symbol for phosphate
P <sub>2</sub> O <sub>5</sub>	Chemical symbol for phosphorus oxide
PON	Program Opportunity Notice

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ppm	Parts per million
ppmv	Parts per million volume
<i>ppmvd</i>	<i>Parts per million volume — dry basis</i>
PROMOD*	Production <i>costing model for electric generation (Energy Management Associates)</i>
PSCN	Public Service Commission of Nevada
PSD	Prevention of Significant Deterioration
psi	Pounds per square inch
psia	Pounds per square inch absolute
PTO	Permit to operate
PVC	Polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
REM	Roentgen Equivalent Man (radiation unit)
ROD	Record of Decision
<i>RPD</i>	<i>Relative percent difference</i>
RQ	Reportable quantity
QA	Quality assurance
S	Chemical symbol for sulfur
SAR	Sodium Adsorption Ratio
SARA	Superfund Amendments and Reauthorization Act of 1986
<i>scf</i>	<i>Standard cubic feet</i>
<i>SCR</i>	<i>Selective catalytic reduction</i>
SCS	Soil Conservation Service (U.S. Department of Agriculture)
SDWA	Safe Drinking Water Act
SEA	SEA, Incorporated
SHPO	State Historic Preservation Officer
SILs	Significant Impact Levels
SiO <sub>2</sub>	Chemical symbol for silica (common beach sand)
<i>SNCR</i>	<i>Selective non-catalytic reduction</i>
SO <sub>2</sub>	Chemical symbol for sulfur dioxide
SO <sub>3</sub>	Chemical symbol for sulfur trioxide
SO <sub>4</sub>	Chemical symbol for sulfate
SODAR	Sound detection and ranging
<i>SOS/T</i>	<i>State-of-science/technology</i>
SO <sub>x</sub>	Chemical symbol for oxides of sulfur

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SPPCo.	Sierra Pacific Power Company
STD	Standard
SUFCO	Southern Utah Fuel Company
T	Temperature
TCID	Truckee-Carson Irrigation District
TCLP	Toxic Characteristic Leaching Procedure
TDS	Total dissolved solids
THC	Total hydrocarbons
TiO <sub>2</sub>	Chemical symbol for titanium dioxide
TMWRF	Truckee Meadows Water Reclamation Facility
TPH	Total petroleum hydrocarbons
TPQ	Threshold planning quantity
<b>TPY</b>	<b><i>Tons per year</i></b>
TROA	Truckee River Operating Agreement
TSCA	Toxic Substances Control Act
TSP	Total suspended particulates
TSS	Total suspended solids
UBC	Uniform Building Code
UNR	University of Nevada at Reno
UPS	Uninterruptible power supply
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
V	Volt
V	Velocity
VOC	Volatile organic compounds
Vol	Volume
yd <sup>3</sup>	Cubic yards
yr	Year
Zn	Chemical symbol for zinc
°C	Degrees Celsius
°F	Degrees Fahrenheit
°K	<b><i>Absolute degrees on the Kelvin scale</i></b>

$\mu$	Micro
$\mu eq$	<i>Micro equivalents</i>
$\mu g$	Microgram
$\mu g/m^3$	Micrograms per cubic meter
@	at
$\Delta P$	<i>Change in pressure</i>
>	greater than
<	less than

## CONVERSION CHART

### WATER FLOW RATES

Throughout this document, water flow rates are presented in standard U.S. customary units. Because most readers are familiar with these units and because of the number of times flow rates are discussed, metric equivalents have not been provided. However, the following tables are presented to allow a reader to convert water flow rates, if desired. Each column provides equivalent measurements. For example, the first column of Table A identifies that:

$$1 \text{ acre-foot} = 3.26(10^5) \text{ gallons} = 4.356(10^4) \text{ cubic feet} = 1.233(10^3) \text{ cubic meters}$$

Table A: Water flow rate conversion — Volume.

	acre-feet	gallons	cubic feet	cubic meters
acre-feet	1	$3.070(10^{-6})$	$2.296(10^{-5})$	$8.107(10^{-4})$
gallons	$3.26(10^5)$	1	7.481	$2.642(10^3)$
cubic feet	$4.356(10^4)$	$1.337(10^{-1})$	1	$3.531(10^1)$
cubic meters	$1.233(10^3)$	$3.8(10^{-3})$	$2.831(10^{-2})$	1

Table B: Water flow rate conversion — Time.

	Seconds	Minutes	Years
Seconds	1	60	31,536,000
Minutes	0.016666667	1	52,560
Years	$3.171(10^{-8})$	$1.903(10^{-5})$	1

For example, to convert 3 cubic feet/second to acre-feet/year the following procedures would be followed:

The conversion factor for cubic feet to acre-feet is provided in Table A. The third column provides the equivalent measurements for 1 cubic foot. The first row of Table A identifies that 1 cubic foot =  $2.296(10^{-5})$  acre-feet.

The conversion factor for seconds to years is provided in Table B. The first column provides the equivalent measurements for 1 second. The third row of Table B identifies that 1 second =  $3.171(10^{-8})$  years.

To determine the flow rate, divide the conversion factor from Table A by the conversion factor from Table B (Flow rate = conversion factor from Table A / conversion factor from Table B). For this example:

$$2.296(10^{-5}) / 3.171(10^{-8}) = 724.06$$

Therefore, 1 cubic foot/second = 724.06 acre-feet/year.

To complete the conversion, multiply both factors by 3.

The conversion would be, 3 cubic feet/second = 2172.18 acre-feet/year.

*For simple conversions, the following factors can be used:*

<i>1 cubic foot</i>	<i>= 7.48 gallons</i> <i>= 62.4 pounds</i>
<i>1 acre-foot</i>	<i>= 43,560 cubic feet</i> <i>= 325,851 gallons</i>
<i>1 cubic foot per second (cfs)</i>	<i>= 449 gallons per minute (gpm)</i>
<i>1 cfs for 24 hours</i>	<i>= 1.9835 acre-feet</i>
<i>1 cfs for 30 days</i>	<i>= 59.5 acre-feet</i>
<i>1 cfs for 1 year</i>	<i>= 724 acre-feet</i>
<i>1 million gallons</i>	<i>= 3.07 acre-feet</i>
<i>1 million gallons per day (mgd)</i>	<i>= 1,120 acre-feet per year</i>
<i>1 mgd</i>	<i>= 1.55 cfs</i>
<i>1,000 gpm</i>	<i>= 4.42 acre-feet per day</i>

# **1. PURPOSE AND NEED FOR PROPOSED ACTION**

## ***1.0 Summary of Changes Since the DEIS***

*Section 1.2 (The Proposed Action) has been revised as a result of proposed project design modifications. Section 1.4 (National Environmental Policy Act (NEPA) Strategy) was updated to include discussion of the public comment process for the DEIS.*

## **1.1 Introduction**

The abundance of coal in the United States makes it one of our Nation's most important strategic resources in building a secure energy future. Coal has the potential to be one of this country's most beneficial and efficient energy sources well into the 21st century and beyond; with today's prices and technology, recoverable reserves located in the United States could supply the Nation's coal consumption at current rates for nearly 300 years. However, if coal is to reach its full potential as an environmentally acceptable and economically competitive source of energy, an expanded menu of advanced clean coal technologies must be developed to provide substantially improved options both for the consumer and private industry.

Since the early 1970s, the U.S. Department of Energy (DOE) and its predecessor organizations have pursued a broadly based coal research and development program directed toward increasing the Nation's opportunities to use its most abundant fossil energy resource while improving environmental quality. This research and development program includes long-term projects that support the development of innovative concepts for a wide variety of coal technologies.

Before any technology can be seriously considered for commercialization, it must be demonstrated at sufficiently large-scale to develop industry confidence in the technical and economic feasibility of that technology. Demonstrating a new technology, however, is costly and can entail a considerable capital risk for a private industry. Public utilities are regulated and must account to a regulating agency and the public for capital funds disbursed, and the economic risk associated with technology demonstration is, in general, too high for the private sector to assume in the absence of strong economic incentives or legal requirements. The implementation of a Federal technology demonstration program is an important means of accelerating the development of technology to meet near-term energy and environmental goals, to

reduce risk to human health and the environment to an acceptable level, and to provide the incentives required for continued activity in innovative research and development directed at providing solutions to long-range energy supply problems.

The Clean Coal Technology (CCT) Program sponsors a broad spectrum of demonstration projects that are jointly funded by the Federal Government and industry. Clean coal technology refers to a new generation of advanced coal utilization technologies that are environmentally cleaner and in many cases more efficient and less costly than conventional coal-using processes. The primary goal of the CCT Program is to open the door for a number of advanced, more efficient, reliable, and environmentally responsive coal utilization and environmental control technologies so they can become available to the U.S. energy marketplace. These technologies are intended to reduce or eliminate many of the economic and environmental impediments that limit the full consideration of coal as a future energy resource in this Nation.

The CCT program takes the best and most promising of the advanced coal-based utilization, processing, and emission control technologies, and over the next decade advances their technical, environmental, and economic performance to the point where the private sector can introduce the demonstrated technologies into the commercial marketplace. These demonstrations are designed on a scale large enough to generate all the data from design, construction, and operation necessary for the private sector to judge the commercial potential of the technology and to make informed confident decisions on commercial readiness.

The portfolio of technologies to be demonstrated as part of the CCT Program will expand the potential market applications for coal. The information gained through successful completion of the demonstrations and broad public dissemination of the environmental performance achieved on each project will establish the information base that will help to ensure a better balance among legitimate goals in environmental programs. In addition, the CCT Program can lead to improved marketability of U.S. coal technologies and open new international markets in the utility, industrial, and commercial sectors. The availability of developed and demonstrated coal technologies that meet environmental objectives of the international community can give the United States a substantial marketing advantage overseas. Further, the potential exists to link U.S. coal exports with coal technologies to strengthen U.S. competitiveness in both areas.

The strategy being implemented to achieve the goal of the CCT Program has been to conduct a multi-phase effort consisting of at least five separate solicitations for projects. Each solicitation had individual objectives (as shown in Figure 1-1), that, when integrated, makes technology options available on a schedule that is intended to be both consistent with the demands of the energy market and responsive to relevant environmental considerations.

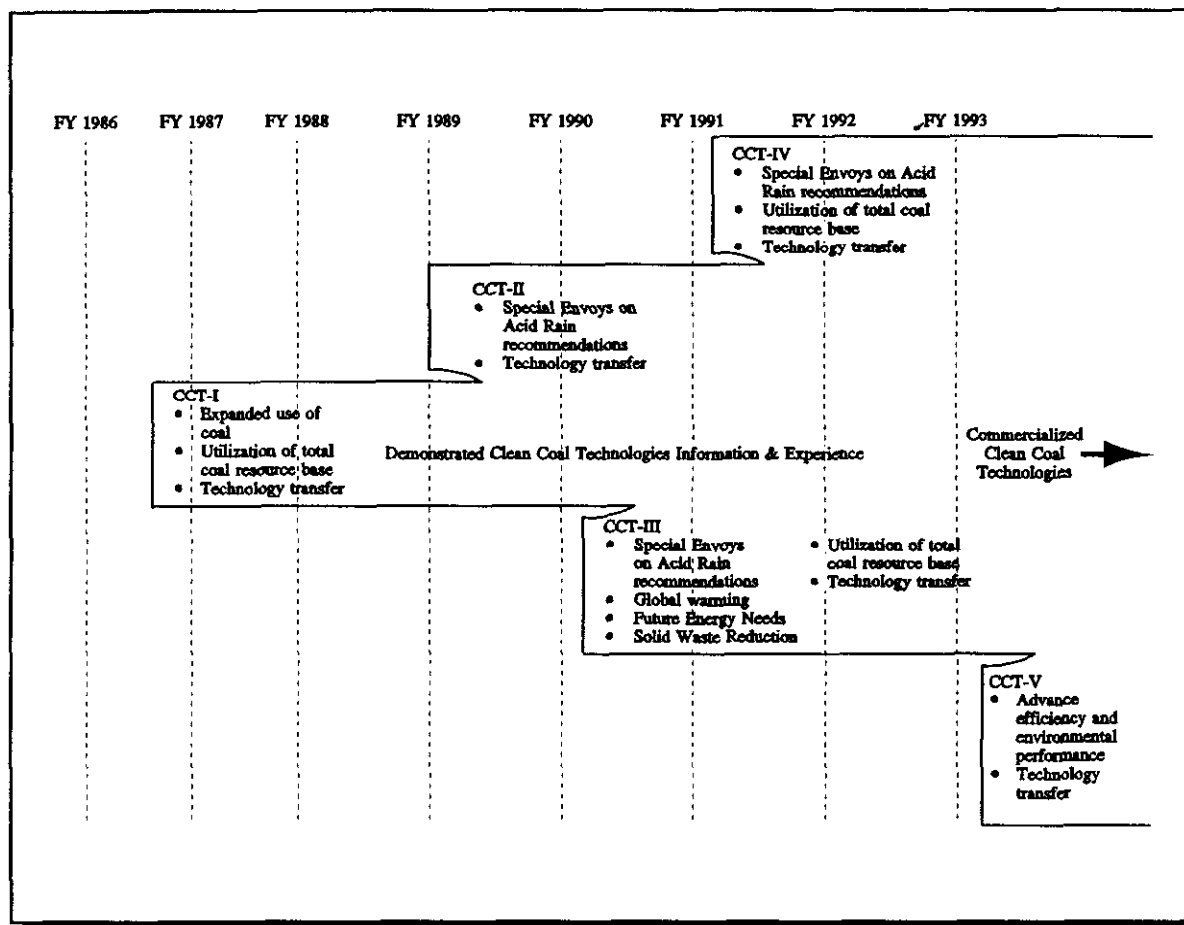


Figure 1-1. Clean Coal Technology Demonstration Program strategy.

On October 23, 1989, with the Department of the Interior and Related Agencies Appropriations Act of 1990, Pub. L. No. 101-121, 103 Stat. 701, Congress made funds available for the fourth round of the clean coal demonstration program (CCT-IV). This Act appropriated funds for the design, construction, and operation of cost-shared, clean coal projects to demonstrate the technical capability of replacing, retrofitting, or repowering existing power generating facilities.

## **Piñon Pine Power Project**

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On January 17, 1991, DOE issued Program Opportunity Notice (PON) Number DE-PSO1-91FE 62271 for the CCT-IV Program that solicited proposals to conduct cost-shared projects to demonstrate innovative, energy-efficient, and economically competitive technologies. These technologies needed to be capable of:

- achieving significant reductions in the emissions of sulfur dioxide (SO<sub>2</sub>) and/or the oxides of nitrogen (NO<sub>x</sub>) from existing facilities to minimize environmental impacts such as transboundary and interstate pollution; and/or
- providing for future energy needs in an environmentally acceptable manner.

In response to the PON, DOE received 33 proposals in May 1991. All of the proposals were evaluated relative to the above-stated objectives of CCT-IV. The nine successful selections included the Piñon Pine Power Project (proposed by Sierra Pacific Power Company, SPPCo.), and were announced on September 12, 1991. In accordance with 10 CFR 1021.216(h), DOE filed the announcement, "Selection of Proposals for the Demonstration of Clean Coal Technologies," with the U.S. Environmental Protection Agency (EPA). Information made available to the public in the selection document, pertaining mainly to site description, environmental setting, and the proposed technology, has been incorporated into this *Final* Environmental Impact Statement (FEIS).

### **1.2 The Proposed Action**

The proposed Federal action would provide approximately \$135 million in cost-shared funding support for the design, construction, and operation of a coal-fired power generating facility, which would be a nominal 800-ton-per-day (approximately 104 megawatt (MW) gross generation), air-blown, Integrated Gasification Combined-Cycle (IGCC) demonstration plant. IGCC is a technology that converts coal into clean gas virtually free of sulfur (S) and particulates (PM<sub>10</sub>), burns the gas in a combustion turbine to generate electricity, and then captures the heat to drive a steam turbine, which generates additional electricity. IGCC systems offer significant potential environmental, economic, and efficiency benefits when compared to conventional pulverized coal-fired plants with flue gas scrubbers. Currently, there are six IGCC projects (including projects proposed under CCT-V), either in the design phase, or in negotiation, in the CCT Program. Although similar in many respects, each of these IGCC projects demonstrates a distinct technology with differing concepts relative to coal gasification, gas stream cleanup, system integration, and technology application. Because of their overall design, IGCC facilities

are expected to emit significantly lower amounts of SO<sub>2</sub>, NO<sub>x</sub>, and PM<sub>10</sub> than other conventional technologies.

The proposed project would be located at SPPCo.'s Tracy Power Station, a power generation facility located on a rural 724-acre plot about 27.4 km (17 miles) east of Reno, NV. The facility consists of three steam generating units fired on either natural gas or number 6 fuel oil producing 53 MW, 83 MW, and 108 MW. In addition, there are two combustion turbines fired on number 2 distillate fuel oil that are used to cover system emergencies and unscheduled outages on other units. SPPCo. *recently installed* two 83.5 MW simple-cycle combustion turbine generating units and auxiliary equipment *to* supply 167 MW (net) of electrical power; two stacks, 16.8 meters (55 feet) tall, are associated with these units.

The total cost of the proposed Piñon Pine Power Project is estimated at \$270 million, with DOE's share being about 50 percent, or \$135 million. DOE's participation in the project would last approximately 96 months, including design, approximately 26 months of construction, and a 42-month demonstration period. The demonstration is expected to generate valuable data for assessing plant reliability and performance and would be an important step leading to widespread commercial application of IGCC technology. If the project is as successful as anticipated, it would demonstrate that IGCC power plants based on this environmentally superior technology could be built cost effectively, with thermal efficiencies that would significantly reduce electric power costs over more conventional technologies. The project also would demonstrate the effectiveness of hot gas cleanup technology in reducing environmental emissions using either its normal fuel of low-sulfur western sub-bituminous/bituminous coal or a high-sulfur eastern bituminous coal, which also would be tested during the demonstration. Fuel type usage requires approval by the Nevada Division of Environmental Protection (NDEP). In addition, this project could encourage electric utilities and industrial power producers to construct similar size or larger units (by adding gasifier island modules) promoting the wide-scale deployment of fluidized-bed IGCC technology.

The Piñon Pine Power Project is unique because of its proposed use of western sub-bituminous/bituminous coal, the external hot gas desulfurization step, and the external combustion of the waste solids from the gasification system. The project is intended to:

- demonstrate that air-blown, fluidized-bed, coal gasification technology incorporating hot gas cleanup would provide higher thermal efficiency due to less auxiliary power consumption compared to the similar developmental oxygen-blown IGCC systems;
- evaluate operation of a low-Btu fuel gas combustion turbine; and
- assess long-term reliability, availability, maintainability, and environmental performance of the IGCC technology in a utility setting at a size sufficient to determine its potential for commercial use.

The proposed Piñon Pine Power Project would utilize the KRW fluidized-bed gasification process, operating in the air-blown mode with in-bed desulfurization and hot gas cleanup technology (a more complete description, *including recently proposed design changes*, is presented in sections 2.1.2 and 2.1.3). The KRW pressurized, air-blown, fluidized-bed gasifier would receive coal and limestone through a pneumatic lockhopper feed system (operating similar to an air lock). The heat *necessary for endothermic gasification reaction is provided by the combustion of char and gas*. The limestone sorbent would provide in-bed desulfurization. Ash and spent limestone would be removed from the bottom of the bed. Before entering the power generation modules, the coal gas would pass through several subsystems where one or more cyclones (funnel-shaped devices designed to remove particles) would remove particulate matter from the coal gas. The particulate matter then would be returned to the fluidized-bed of the gasifier. Heat exchangers would reduce the temperature of the gas from 982 degrees Celsius (°C) [1,800 degrees Fahrenheit (°F)] to 538°C (1,000°F); the generated steam would be transferred to the heat recovery steam generator (HRSG) system. The hot gas cleanup section would use a regenerable zinc-based sulfur sorbent to remove nearly all remaining sulfur compounds. Keeping the gas hot would increase plant efficiency and decrease the consumption of both water and fuel. Use of hot gas cleanup would result in extremely clean exhaust gas. A "barrier filter," located in this section, would remove essentially all remaining particulate matter from the gas before it enters the combustion turbine.

A combustion turbine generator would be capable of using natural gas and propane, as well as coal gas. The combustion turbine would convert coal gas into approximately 61 MW gross of electricity and produce exhaust gases. The HRSG system would use these exhaust gases to superheat high pressure steam to a nominal temperature of 510°C (950°F) and 950 psia (pounds per square inch absolute; 67.17 kilograms-force/cm<sup>2</sup>). The steam turbine would produce approximately 43 MW gross of electricity by

expansion of the steam produced by the HRSG. The total electrical (gross) generation, then, would be 61 MW plus 43 MW for a total of 104 MW.

The support facilities required for the proposed project would include coal and limestone storage and handling, ash handling and disposal, cooling water supply, control rooms, and other infrastructures. Construction activities would include building an additional evaporation pond, installing propane gas storage tanks, and modifying existing transportation facilities.

### **1.3 Purpose and Need**

#### **1.3.1 DOE Purpose**

The proposed Piñon Pine Power Project was selected as one of nine projects that would best further the objectives identified in the CCT-IV PON. The purpose of this proposed project is to demonstrate an advanced IGCC system based on the air-blown fluidized-bed KRW gasifier with in-bed desulfurization and an external sulfur removal system. The Piñon Pine Power Project is the only project offered in response to the CCT Program solicitations that proposes to demonstrate this combination of technologies. The integrated performance to be demonstrated would involve all of the process subsystems, including coal feeding; a pressurized air-blown, fluidized-bed gasifier; a hot gas conditioning system for removing sulfur compounds, particulates, and other contaminants; an efficient combustion turbine modified to utilize low-Btu coal as fuel; and an HRSG system. Integration of the gasifier with the combined-cycle power plant would allow for evaluation of the adequacy of integrated control concepts and for measurement of actual performance of a complete power generation system on a utility grid. In several aspects, the proposed Piñon Pine Power Project would be similar to, but would improve upon, first generation IGCC technology. The pressurized air-blown, fluidized-bed gasification technology is designed to provide a higher thermal efficiency than similar oxygen-blown systems because it would consume less auxiliary power. Most of the sulfur pollutants would be captured within the fluidized-bed before exiting the gasifier. Additional impurities would be removed through an advanced hot gas cleanup system, which would operate with an effective, regenerable, desulfurization sorbent to remove sulfur compounds and with barrier filters to remove particulates. The modular concept of the proposed technology would provide information that would be directly applicable to future commercial plants based on this technology.

### **1.3.2 DOE Need**

The goal of the Clean Coal Technology Program as established by Congress is to make available to the U.S. energy marketplace advanced and environmentally responsive technologies that will help alleviate pollution problems from coal utilization. Solutions to a number of key energy issues are directly dependent upon the degree to which coal can be considered an available energy option. These issues include: (1) long-range requirements for increased power demand; (2) need for energy security; and (3) increased competitiveness in the international marketplace.

Almost 50 percent of the current inventory of electrical generating capacity in the United States will be more than 30 years old by 1997. The need to replace or refurbish this capacity, plus adding new capacity to keep pace with the rising demand for electricity, means that a major investment in electrical generation capacity should begin by the mid 1990s. Improved technologies, using available energy resources, must be developed and tested for use on a commercial basis prior to the year 2000 to keep pace with economic and environmental challenges.

Coal is the most abundant energy resource in the United States, with recoverable reserves estimated to be equal to 935 billion barrels of crude oil equivalent (COE). However, petroleum and natural gas, whose proven reserves are estimated to be 28 billion and 35 billion barrels COE, respectively, are the most utilized fossil fuels in the U.S. energy-consuming marketplace, despite their significantly higher costs relative to coal. Coal use is demand-driven, and the capacity exists to increase coal supplies to meet significant increases in demand.

In DOE's examination of domestic energy-related security interests, contained in the Energy Security Report (*DOE, 1987*), coal was recognized as having substantial potential to reduce dependence on imported oil and to enhance free-world energy security. The report notes that coal supplies are abundant in many countries and subject to widespread competition, and that coal availability is relatively insulated from foreign political manipulation. However, the report recognizes that coal's ability to compete with oil and gas needs to improve. The report pinpoints five principal areas where actions are needed:

- continuing contributions to the technological base for "clean coal" use;
- broadening opportunities to choose coal as a fuel;
- ensuring balanced environmental programs;

- expanding U.S. coal exports; and
- removing barriers to an efficient coal supply chain.

The CCT Program largely contributes to these recommended areas of activities.

If successful, the proposed Piñon Pine Power Project would advance DOE's objective of demonstrating technical, economic, and environmental viability of commercial-scale operation of coal-based power generation technologies with a prototype module that could be replicated for use by utilities and other industries in the late 1990s and the early part of the next century. The project represents an integration of the latest developing gasification and power generation technologies that would provide industry and electric utilities with a major source of clean, dependable, and economical electricity. The ability to show a prospective overseas customer an actual operating facility running on U.S. coal, rather than just using a drawing-board concept or an engineering model, is expected to be a very persuasive inducement when marketing the technology; it easily could be the advantage that would sway overseas consumers to buy an American package of coal and the proven clean coal technologies. The opportunity is consistent with and recognizes the increasing demand for safe, effective technology that does not impose further burdens on environmental quality.

The commercialization of environmentally progressive technologies using coal, which is a relatively inexpensive fuel source, is an important step for the electric utility industry as it endeavors to balance environmental costs and benefits of electricity generation. The proposed Piñon Pine Power Project would make a significant contribution to the new technologies available to electric-generating utilities, independent power producers, and cogenerators in their efforts to produce power economically from abundantly available coal in an environmentally acceptable way. The proposed project would have low NO<sub>x</sub> emissions and capture (*on a total system basis*) approximately 92 percent of the sulfur (S) present in the coal. The high overall efficiency would reduce the amount of greenhouse gases (e.g., CO<sub>2</sub>) produced per kilowatt-hour (Kwh) of electricity compared to conventional coal-fired technologies. Successful demonstration would make this technology a leading technology for compliance with the Clean Air Act (CAA) and New Source Performance Standards (NSPS) requirements.

### **1.3.3 SPPCo. Need**

The reasons that SPPCo. proposed the Piñon Pine Power Project are more specific to its need to provide power to its customers in a cost-effective manner. SPPCo. serves 250,905 electric customers in northern Nevada and northeastern California. Currently, SPPCo. can generate approximately 833 MW of electricity and has contracts to purchase up to 417 MW as needed to serve its customers. The electricity needs of its customers have grown over the last decade, and growth is expected to continue to the year 2000 and beyond. Over the next 10 years, SPPCo. anticipates that an additional 450 MW will be required. Approximately 100 MW of this increase is expected to be met by an aggressive Demand Side Management Program (i.e., conservation of electricity by customers); however, the remaining 350 MW must be met by new resource options. To meet immediate customer demands, SPPCo. proposed and the Public Service Commission of Nevada (PSCN) authorized construction of two 83.5 MW combustion turbines. This combustion turbine project (which will supply 167 MW (net) of electric power) is the first part of an integral SPPCo. plan to meet anticipated load growth. The combustion turbines use either natural gas or distillate (#2 diesel) for fuel; natural gas *is* supplied by the existing natural gas delivery system. The Piñon Pine Power Project was proposed to the PSCN as another part of SPPCo.'s plan to meet anticipated load growth and was described in the company's Electric Resource Plan (*PSCN Docket #92-7001 and #93-4001*) as the least cost option for meeting its capacity needs. As explained by SPPCo., additional attributes associated with the proposed Piñon Pine Power Project would be that coal is forecasted to remain substantially cheaper than natural gas as a fuel for generation; fuel flexibility would provide SPPCo. with the ability to use the most economical fuel available throughout the plant's life; the 104 MW capacity would be an excellent match with SPPCo.'s requirement for baseload generation in the late 1990s; the IGCC technology would be 10-15 percent more efficient than conventional baseload plants; and the proposed Piñon Pine Power Project would be key to holding the "coal option" open to SPPCo. in the future. On November 8, 1993, the PSCN issued an Interim Order granting resource planning approval (funding) for the proposed Piñon Pine Power Project citing the advantages of flexibility, diversity, displacement of fuel, and reliability (*PSCN Docket No. 93-4001*). *DOE has independently reviewed the PSCN conclusions and finds them reasonable.*

## **1.4 National Environmental Policy Act (NEPA) Strategy**

An overall strategy for compliance with NEPA was developed for the CCT Program, consistent with the CEQ NEPA regulations and DOE regulations for compliance with NEPA, which includes consideration of both programmatic and project-specific environmental impacts during and after the

process of selecting a project. This strategy is called tiering (40 CFR 1508.28), which refers to the coverage of general matters in a broader Environmental Impact Statement (EIS) (e.g., for the CCT Program) with subsequent narrower statements of environmental analyses incorporating by reference the general discussions and concentrating solely on the issues specific to each statement prepared subsequently. Tiering eliminates repetitive discussions of the same issues and focuses on the actual issues ripe for decision at each level of environmental review.

The DOE strategy has three principal elements. The first element involved preparation of a comprehensive Programmatic Environmental Impact Statement (PEIS) for the CCT Program, published in November 1989 (DOE/EIS-0146), to address the potential environmental consequences of widespread commercialization by the year 2010 for each of 22 successfully demonstrated clean coal technologies. The PEIS evaluated (1) a no-action alternative, which assumed that the CCT Program was not continued and that conventional coal-fired technologies with flue gas desulfurization controls would continue to be used for new plants or as replacements for existing plants that are retired or refurbished, and (2) a proposed action, which assumed that CCT Program projects were selected for funding and that successfully demonstrated technologies would undergo widespread commercialization by 2010.

The second element involves preparation of a preselection, project-specific, environmental review for proposed projects. Each review was based on project-specific environmental data and analyses that the offeror supplied to DOE as part of the proposal. The review for the proposed Piñon Pine Power Project contained discussions of the site-specific environmental, health, safety, and socioeconomic issues associated with the project. The preselection review analyzed the advantages and disadvantages of the proposed and alternative sites and/or processes reasonably available to the offeror. Because this review contains proprietary data supplied by the offeror, it is not made publicly available. However, the DOE announcement of proposals selected for the demonstration of clean coal technologies was made publicly available and filed with the EPA. Information related to the selection process and the criteria used has been incorporated into this *FEIS*.

Between the time of selection and the development of specific NEPA documentation (the third element of DOE's NEPA strategy process), project-specific engineering and environmental issues were evaluated by DOE. The objective of this independent DOE analysis was to ensure that site and technology selection were optimal in terms of both environmental issues and cost-effectiveness. The information presented in this *FEIS* summarizes this analysis (see section 2.2.1), which resulted in the

## Piñon Pine Power Project

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proposed project being sited in the most environmentally beneficial and most cost-effective site within the participant's service area.

Subsequently, DOE determined that providing cost-shared funding support for the proposed Piñon Pine Power Project constitutes a major Federal action that may significantly affect the quality of the human environment, within the meaning of NEPA. Therefore, DOE determined that the appropriate level of NEPA review is an Environmental Impact Statement (EIS) to address project-specific concerns. As part of the overall NEPA strategy for the CCT Program, this *FEIS* draws upon all of the above: the PEIS, preselection environmental reviews, and the pre-NEPA reviews that analyzed many alternatives and scenarios (e.g., alternative technologies and regions/sites).

As part of the EIS preparation process, DOE required the Industrial Participant (SPPCo.) to produce an Environmental Information Volume (EIV). SPPCo.'s EIV is one of the major source documents used to provide information for preparation of this *FEIS*. In addition to the EIV, a technology supplement was prepared by SPPCo. and nine technical reports were prepared by Ebasco Environmental with SPPCo.; information from the technical reports also has been incorporated into this document. One of these reports, Historic Properties Inventory and Archaeological Site Evaluation, was submitted to the State Historic Preservation Officer (SHPO). The Biological Assessment for the Cui-ui, Lahontan Cutthroat Trout, and Bald Eagle, has been submitted to the U.S. Fish and Wildlife Service (USFWS). The EIV and these supplemental technical reports are available in the public reading rooms (see Appendix H). As required under NEPA, additional information was obtained through the public scoping process. DOE began the process for *the* DEIS with the publication of a Notice of Intent (NOI) to prepare an EIS and to conduct public scoping meetings. The NOI was published in the Federal Register on Tuesday, June 30, 1992 (57 FR 29067-29070). The text of the NOI also was published in a local newspaper, The Reno Gazette Journal, on July 14, 1992. Similar public notices were published in The Reno Gazette Journal, on July 12 and 19, 1992, and the Fernley Leader on July 15, 1992. A copy of either the NOI or the public notice also was sent to Federal, state, and local agencies; environmental groups; and other organizations to solicit information and their comments on the proposed project.

Three public scoping meetings were held by DOE for the proposed Piñon Pine Power Project. The first meeting was held on Tuesday, July 21, 1992, at the Pyramid Lake Paiute Indian Tribal Council Chamber in Nixon, NV. The second meeting was held at the Lyon County Branch Library in Fernley, NV, on Wednesday, July 22, 1992. The third meeting was held at the City of Reno Council Chambers in Reno, NV, on Thursday, July 23, 1992. The public was invited to provide oral comments at the

scoping meetings and to submit additional comments in writing to DOE by the close of the scoping period on August 7, 1992. Based on these comments and other information gathered by DOE, an Implementation Plan was produced which addressed the disposition of the public comments received and described the procedures for completing *the* DEIS, including an outline of the topics to be included. This Implementation Plan also is available in the public reading rooms (see Appendix H).

*The DEIS was produced in May 1994 and mailed to the individuals and agencies identified on the distribution list (see Chapter 13). A Notice of Availability (NOA) was published in the Federal Register by DOE on May 26, 1994 (59 FR 27266), and by EPA on May, 27, 1994 (59 FR 27546). The text of DOE's NOA also was published in The Reno Gazette Journal on June 8, June 12, June 15, and June 19, 1994. Similar public notices were published in the Comstock Chronicle (June 10 and June 17, 1994); the Mason Valley News (June 9 and June 12, 1994); the Lahontan Valley News and Fallon Eagle Standard (June 8 and June 15, 1994), and the Nevada Appeal (June 8, June 12, June 15, and June 19, 1994). In addition, a public service announcement on Sierra Nevada Community Access Television ran from June 13 to June 23, 1994. Three public hearings were held by DOE for the DEIS. Public hearings on the DEIS were held at the Pyramid Lake Paiute Indian Tribal Council Chamber in Nixon, NV, on June 21, 1994; at the Rainbow Bend Country Club in Storey County, NV, on June 22, 1994; at the University of Reno in Reno, NV, on June 23, 1994. The public was invited to provide oral comments at these hearings and to submit written comments to DOE by the close of the public comment period on July 23, 1994. In preparing the FEIS, DOE considered 181 oral and written comments. Copies of these comments are provided in Appendix I of this document. Responses to the comments are provided in Appendix J.*

## **1.5 Scope of the Environmental Impact Statement**

This FEIS complies with DOE requirements for preparation of NEPA documents (10 CFR Part 1021) and is organized in accordance with CEQ recommendations (40 CFR 1502.10). Two alternatives are evaluated in detail: the proposed action, which is to fund the project (an innovative coal-based technology) as proposed (see section 2.1); and the no-action alternative whereby DOE would not provide funding for the proposed Piñon Pine Power Project (see section 2.2.2). Any other alternative that would not achieve the CCT Program goals is not within the purview of this document. If DOE's decision is the no-action alternative (not to fund the CCT project), then SPPCo. would need to select an alternate option for power generation. The "most reasonable" alternative for SPPCo. would be to construct an

additional power plant in response to the need for power (as outlined in section 1.3.2). Such a facility would not have the capability of being fueled by coal, and thus would not address CCT program goals.

The environmental impact issues covered in this *FEIS* are listed in Table 1-1 by the degree of detail provided. Inclusion of issues was based on public comments received through the public scoping process and by independent identification by DOE. Several issues were identified in the Notice of Intent (NOI) (57 FR 29067), including air quality, water resources and water quality, wetlands, land use, socioeconomics, solid waste, biological resources, cultural resources, and cumulative impacts. Additional issues pertaining to health and safety, geology and soils, and mitigation were identified during the public scoping process. *In addition, information has been added to the FEIS based on comments received on the DEIS.* All issues are evaluated for both the construction and operation phases of the

proposed project and for the no-action alternative, where applicable. In addition, discussions are provided that present probable outcomes from a successful demonstration and a failed demonstration. The most detailed analyses focus on the level of impacts that could be expected in air quality, and water quality and quantity. Of special concern are the impacts to an endangered species, the Cui-ui. Other areas of detailed analyses include the disposal of LASH (spent limestone and coal ash mixture), noise, and special engineering requirements for construction because of the site's geologic and soil features. This *FEIS* also examines land use, aesthetics, floodplains, cultural resources, and health and safety programs. Impacts to socioeconomic resources such as employment and income, tax revenues, housing, and public services also are discussed. Impacts resulting from the two alternatives described in Chapter 2 are analyzed in

**Table 1-1. Issues analyzed in the *FEIS*.**

**Issues Analyzed in Detail**

- Proposed project
- No-action alternative
- Air quality
- Geology and soils
- Water resources and water quality
- Biological resources and biodiversity
- Solid and hazardous wastes
- Noise
- Regulatory compliance
- Mitigation

**Other Issues Analyzed**

- Need for project
- Aesthetics
- Wetlands
- Floodplains
- Land use
- Cultural resources
- Socioeconomics
- Environmental justice
- Health and safety
- Pollution prevention
- Cumulative impacts

**Other Issues Discussed**

- Alternative sites
- Need for electrical generation
- Technology success/failure

Chapter 4; mitigation measures are summarized in section 4.3. The environmental impacts assessment methodology used to conduct these analyses is provided in Appendix A.

DOE provides Federal agencies with the opportunity to become cooperating agencies according to jurisdiction by law or special expertise on environmental issues (40 CFR 1501.6). For *the* DEIS, no agency requested cooperating agency status. However, DOE has consulted with agencies responsible for the geographical area, natural resources, and regulations pertaining to the environmental protection of the region covered by this *FEIS*, and information from these agencies has been used in the preparation of the *FEIS*. These agencies have an interest in the outcome and provided valuable input for the technical evaluation of the DEIS; DOE continued consultations throughout the process. A list of some of the agencies consulted and the subject areas discussed is provided in Table 1-2.

Table 1-2. Agency consultations.

U.S. Environmental Protection Agency	Air Pollution, Water Pollution, Wetlands, Floodplains, Waste Management and Transportation
U.S. Department of the Interior Bureau of Land Management	Water Resources, Land Management, Bedell Flat Pipelines Rights-of-Way
U.S. Department of the Interior U.S. Fish and Wildlife Service	Endangered Species, Migratory Birds, Wetlands, Floodplains, River Status, Water Pollution
<i>U.S. Department of the Interior Bureau of Indian Affairs</i>	<i>Surface Water Supply, Environmental Justice</i>
U.S. Army Corps of Engineers	Navigable Waters of the United States, Wetlands, Floodplains
Federal Emergency Management Agency	Floodplains
U.S. Department of Transportation	Waste Management and Transportation
U.S. Department of Agriculture Soil Conservation Service U.S. Forest Service	Soils, Prime and Unique Farmlands, Air Pollution
U.S. Department of Labor Occupational Safety and Health Administration	Operational Hazards
U.S. Department of Justice Federal Water Master	Surface Water Supply
President's Advisory Council	Archaeological, Historical, and Cultural Preservation
Nevada Division of Environmental Protection	Air Pollution, Water Pollution, Waste Management and Transportation, Siting and Planning
Washoe County (NV) District Health Department	Air Pollution
Storey County (NV)	Air Pollution, Water Pollution, Waste Management and Transportation, Siting and Planning, Operational Hazards
Nevada Division of Wildlife	Endangered Species
State Historic Preservation Officer	Archaeological, Historical, and Cultural Preservation

## **2. THE PROPOSED ACTION AND ALTERNATIVES**

This chapter discusses the proposed action (DOE provides cost-shared funding for the design, construction, and operation of the Piñon Pine Power Project) and the no-action alternative (DOE does not provide funding for the Piñon Pine Power Project). The proposed action is one of the proposals selected under Round IV of the Clean Coal Technology Program and would demonstrate an innovative air-blown IGCC technology. This technology, when compared to conventional coal burning technologies, would result in a cost effective reduction in emissions of sulfur, oxides of nitrogen, and particles from a 104 MW coal-fired (800-ton-per-day) power plant. The proposed Federal action is the cost-shared funding of the project by DOE of approximately \$135 million (about 50 percent of the total cost of \$270 million) to assess long-term reliability, maintainability, and environmental performance of the IGCC technology at a utility scale and setting. Following a 42-month demonstration period, anticipated to conclude in August 2000, the facility would enter commercial operation. This section also considers the no-action alternative (including a scenario that reasonably would be expected to result as a consequence of the no-action alternative). In addition, a summary is provided regarding additional alternatives that were considered but not analyzed because they are not considered to be reasonable alternatives under the CCT program. Finally, a comparative synopsis of potential impacts (including the potential impacts of noise during operations, discussed in detail in Chapter 4) is presented for the two alternatives.

### ***2.0 Summary of Changes Since the DEIS***

*After the DEIS was prepared, SPPCo. incorporated some design changes into the proposed project. In some instances, actual physical characteristics of the emission sources were changed and new emission sources were identified:*

- *The height of the exhaust stack would be reduced from 91 meters (300 feet) to 68.5 meters (225 feet);*
- *The height of the start-up heaters' stack would be reduced to 15 meters (50 feet);*
- *The cell diameter of the cooling tower would be reduced to 6.7 meters (22 feet);*

- *The gasifier feed vent, previously incorporated in the coal preparation area, would be moved, and would become a unique emission source;*
- *A new emission source, a single-cell wastewater cooling tower for condensing wastewater from the cooling tower prior to discharge into the evaporation pond, would be incorporated;*
- *The evaporation pond size would be reduced;*
- *A more efficient drift eliminator would be used; and*
- *The emission point height and diameter would be increased for the coal preparation area.*

*Some changes involve operations:*

- *The exhaust temperature for the combustion turbine/heat recovery steam generator (HRSG) would be reduced to 93°C (200°F);*
- *The start-up heaters' stack temperature would be increased to 1,006°K; and*
- *Annual operating hours of the raw coal storage dome would be 3,500.*

*Most of the changes involve the relocation within the existing plant site of facilities and emission points. The following facilities/emissions sources would be relocated [typically by less than 50 meters (164 feet)]:*

- *Flare;*
- *Coal dryer;*
- *Cooling tower;*
- *Wastewater cooling tower;*

- Rail car unloading;
- Raw coal storage dome;
- Coal preparation;
- Coal day bin storage;
- Coke storage bin;
- Line storage bin;
- Solid waste storage;
- Gasifier feed vent; and
- Nitrogen processing plant.

*The site map of proposed project facilities as presented in the DEIS is provided as Figure 2.0-a so that comparisons with new locations (Figure 2.0-b) can be made. Table 2.0-a summarizes these design modifications, and the description of the proposed project (section 2.1.3) has been revised to reflect these changes.*

*Other changes that appear in Chapter 2 include an updated description of the gas desulfurization process, the fact that the septic system was found to have adequate capacity to accommodate the proposed project, completion of two combustion turbines that are not part of the proposed project, relocation of a new well that is not part of the proposed project, and construction of a nitrogen generating plant if a suitable alternative means of obtaining nitrogen cannot be found. Other changes include explanatory information provided in response to public comments; more specifically, analyses that had been conducted on air emissions control options and dry cooling technologies were included, and air emissions and water conservation concerns were more fully addressed.*

Table 2.0-a. Engineering design changes in proposed project since publication of the Draft EIS.

Facility	Change from DEIS to FEIS	Reason
CT/HRSG, Sulfation Combustor	Reduction of stack height from 91 meters (300 feet) to 68.5 meters (225 feet)	Reduced cost for stack construction
	Change in exhaust gas temperature and exit velocity	Refinement in engineering analysis
Coal Dryer, Material Storage Silos, Coal Unloading Area	Relocation of sources (approximately 79 to 110 meters (260 to 360 feet) to the northwest)	Refinement in plant layout to reduce cost for conveyor systems, accommodate efficient site grading
Cooling Tower	Reduction in $PM_{10}$ emission rate	Refinement of initial estimate of tower drift rate
	Relocation of source (approximately 230 meters (754 feet) to the northwest)	Refinement in plant layout to accommodate efficient site grading
Coal Prep Area	Reduction in $PM_{10}$ emission rate	Relocation of gasifier feed vent (previously included in coal preparation area emissions)
Coal Storage	Reduction in height or storage facility from 61 meters (200 feet) to 23 meters (75 feet) and relocation of source (approximately 251 meters (823 feet) to the northwest)	Use of single coal storage dome to reduce cost and improve overall plant efficiency [this dome was reflected in the Draft EIS]
Gasifier Feed Vent, Sulfator Depressurization Vent, Sorbent Storage Vent	Addition of minor particulate sources (less than 0.1 g/s)	Addition of depressurization vents to accommodate equipment design considerations
Wastewater Cooling Tower	Addition of minor particulate sources (emissions less than 0.1 g/s)	Addition of wastewater cooling tower to reduce size and cost of evaporation pond
Evaporation Pond	Reduction in pond size	Addition of wastewater cooling tower reduced required pond size and cost of pond construction

Figure 2.0a. Site map of proposed action facilities as presented in DEIS.

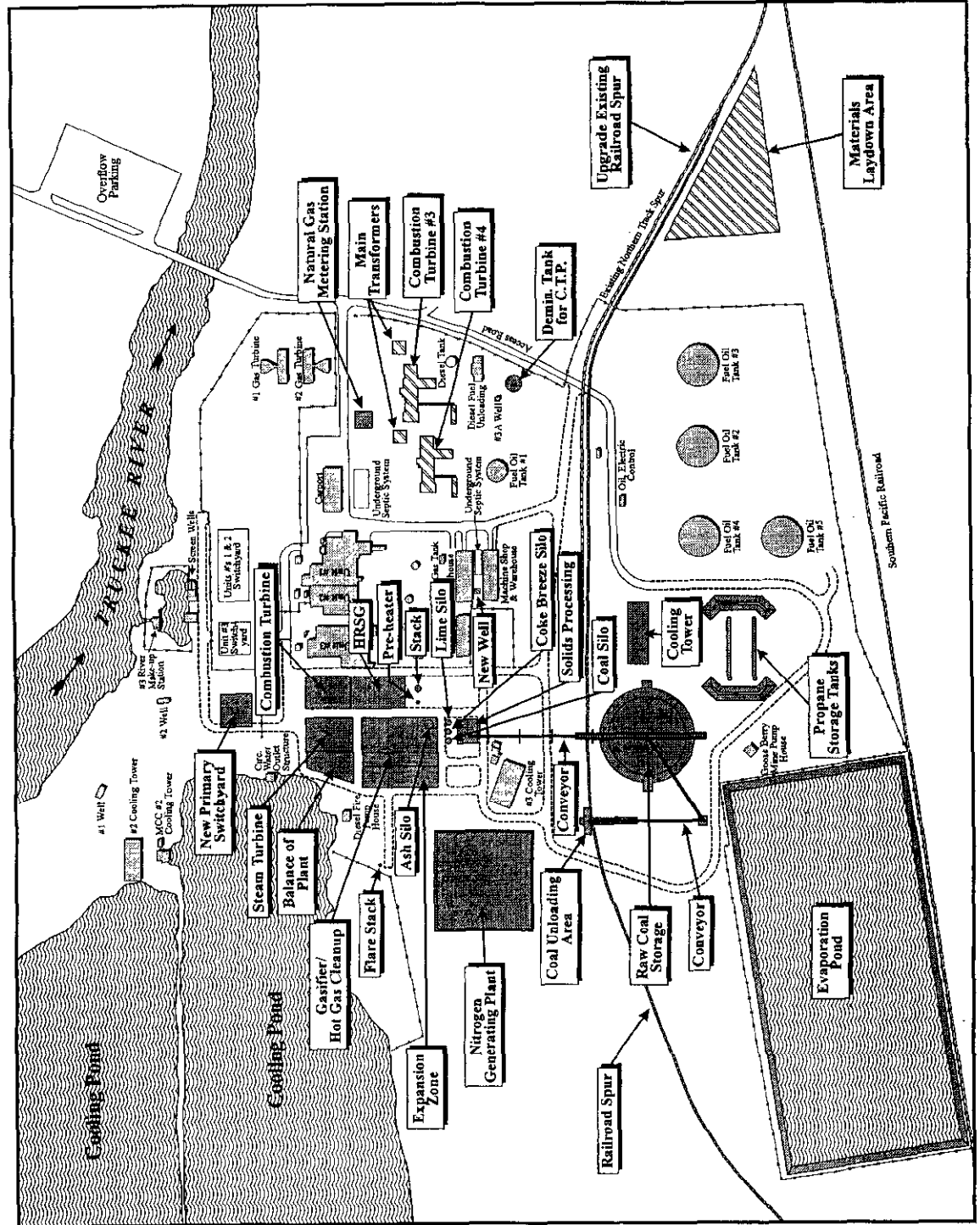
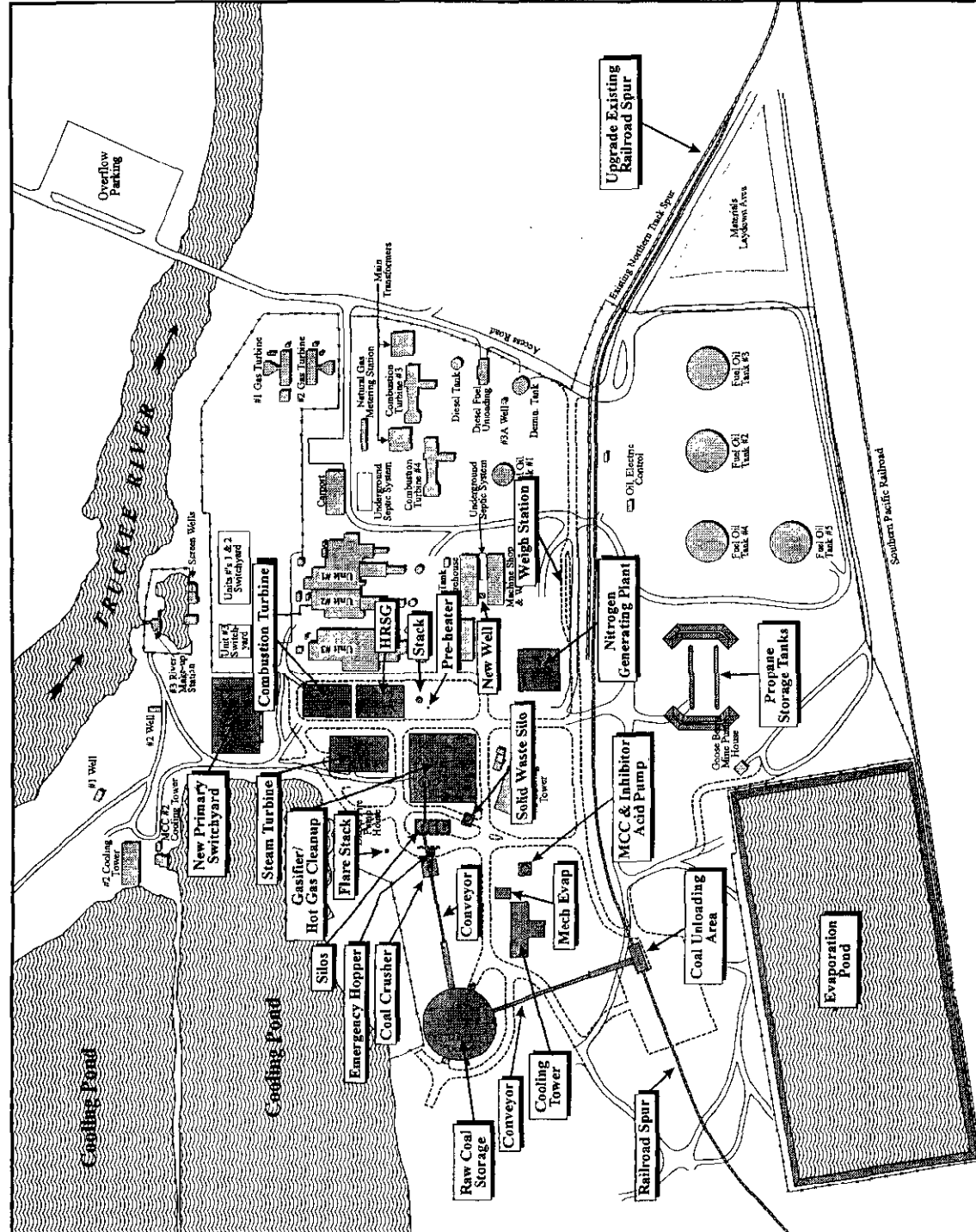


Figure 2.0b. Site map of proposed action facilities as presented in FEIS.



## 2.1 The Proposed Action

The proposed Federal action is for DOE to provide cost-shared funding support for the design, construction, and operation of the Piñon Pine Power Project. This clean coal technology project is expected to require 800 tons per day of moisture-free coal and to generate approximately 104 megawatts (gross) of power using an air-blown, Integrated Gasification Combined-Cycle (IGCC) power plant proposed by Sierra Pacific Power Company (SPPCo.) for its Tracy Power Station near Reno, NV (see Figure 2.1-1). DOE's overall purpose in supporting the proposed project is to demonstrate that IGCC technology is cost-effective and can reduce emissions of sulfur dioxide ( $\text{SO}_2$ ), oxides of nitrogen ( $\text{NO}_x$ ), and particulates ( $\text{PM}_{10}$ ).

SPPCo. has entered into a contract agreement with Foster Wheeler USA Corporation (Foster Wheeler) for the proposed project. In addition, the MW Kellogg Company (Kellogg) would be a subcontractor for the design of a key part of the IGCC system, i.e., the KRW fluidized-bed gasification process.

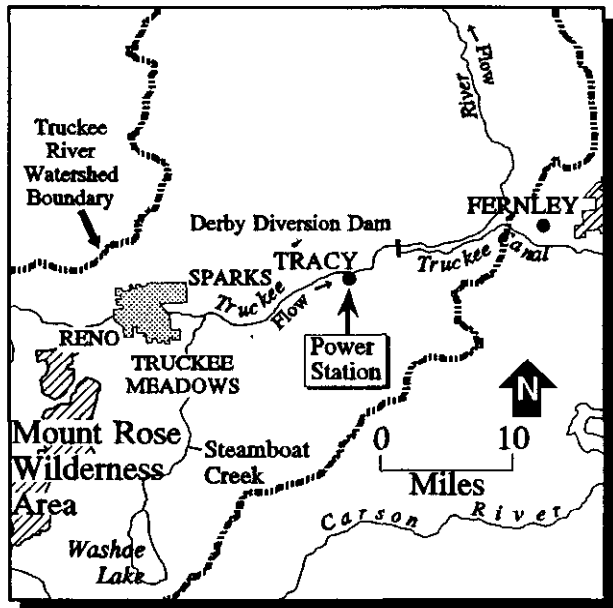


Figure 2.1-1. Location of Tracy Power Station.

### 2.1.1 Project Location

The proposed Piñon Pine Power Project would be located at SPPCo.'s Tracy Power Station in Storey County, near Reno, NV. The 724-acre site is owned entirely by SPPCo. The proposed facility would be situated to the west of Unit 3 (an existing steam-electric generating unit). Additional facilities also are planned for coal receipt, storage, and handling; LASH handling and disposal; cooling water; control room; and other operations. Proposed facilities incorporated with existing structures at Tracy Station are illustrated in Figure 2.1.1-1. Two combustion turbines (shown southeast of the carport) *recently were constructed* at the Tracy Station site and *became operational in* June 1994. Only the existing transmission lines would be required for the Piñon Pine Power Project. No new transmission lines would be constructed. A more detailed description of the project's location is provided in section 3.1.

### 2.1.2 Technology Summary

The proposed Piñon Pine Power Project would demonstrate the performance of a coal-based IGCC power plant. The IGCC power plant would include a gasifier island (based on KRW's pressurized, air-blown, fluidized-bed coal gasifier), coupled to a combustion turbine and steam turbine-based power island. The gasifier island would include a *pressurized* pneumatic coal feed system, fed by lockhoppers; and an air-blown KRW gasifier. Lockhoppers are pressure vessels (similar to air locks) that allow variations in pressure in order to increase or decrease the pressure of the vessel contents. Coal would be fed from an atmospheric pressure bin into the lockhopper. When the lockhopper is full, fill valves would be closed and pressurized gas would be allowed to enter the vessel, raising the lockhopper pressure to slightly exceed that of the gasifier. Coal then would exit the lockhopper and enter the gasifier. The power island would include a combustion turbine (approximately 61 MW gross) capable of using natural gas, coal gas, or propane; a heat recovery steam generator (HRSG) system capable of supplying superheated high-pressure steam generated in the HRSG and the gasification and desulfurization sections; a steam turbine (approximately 43 MW gross); and all required control and auxiliary systems.

The four major processes of an IGCC facility are: (1) converting coal (via partial oxidation and gasification) into a fuel gas, (2) cleaning the fuel gas, (3) using the clean fuel gas to fire a combustion turbine generator and using the hot turbine exhaust to make steam which drives a steam turbine generator, and (4) treating the waste streams generated. The primary components of the process flow for the proposed technology are shown in Figure 2.1.2-1.

The facility would receive coal from an upgraded existing rail system. After crushing, the coal would be fed to the pressurized gasifier through a lockhopper system. The gasifier bed would be maintained in a fluidized form by injecting controlled amounts of steam, recycle gas, and air through special nozzles into the combustion zone. The heat from this zone would cause the coal in the bed to gasify. To capture some of the sulfur compounds in the coal, crushed limestone would be added to the gasifier as a desulfurizing medium (a material that chemically combines with sulfur). In this process, a portion of the sulfur would react with the limestone to form calcium sulfide (CaS), which after subsequent oxidation in a fluidized-bed sulfator [a unit in which the CaS would be oxidized to form calcium sulfate (CaSO<sub>4</sub>)], would exit the gasifier island as CaSO<sub>4</sub> (gypsum) along with the coal ash in the form of agglomerated (or clustered) particles (known as "LASH," a mixture of spent lime, gypsum, and ash) suitable for landfill disposal.



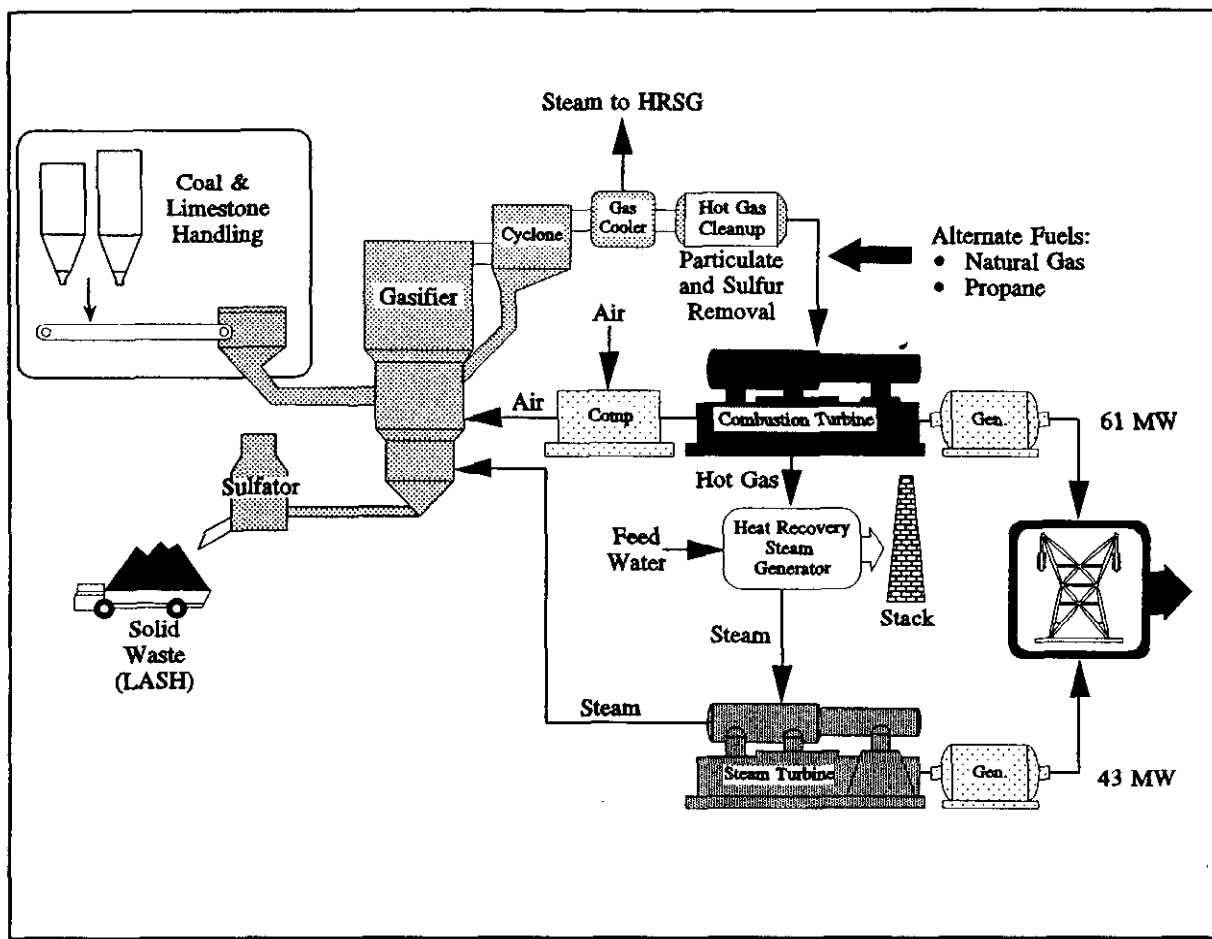


Figure 2.1.2-1. Diagram of technology process.

Coal gas leaving the gasifier would spin through a cyclone unit to remove nearly all of the particulate matter, which then would be returned to the fluidized-bed. The gas leaving the gasifier would be cooled slightly before entering the hot gas cleanup section, where a device employing barrier filters would remove essentially all of the remaining particulate material. Approximately 95 percent of the remaining *sulfur* (that was not removed in the gasifier) would be removed in a zinc-based sorbent desulfurization vessel prior to the clean gas entering the combustion turbine. The combustion turbine would be coupled to an electric generator, and have the added flexibility to burn natural gas or propane. Heat in the combustion turbine exhaust gases would be used to generate steam in a HRSG. Steam produced in the HRSG and the gasifier island would drive a non-reheat condensing steam turbine generator.

A 3-cell mechanical induced-draft counterflow cooling tower would be used to cool and condense process water for the project. The *expected* maximum water flow through the cooling tower is 29,000 gallons per minute (gpm), of which approximately 768 gpm *would be* lost to evaporation. The cooling tower design includes drift eliminators and is rated at a maximum drift of 2 gpm. The cooling tower would emit particulate matter in the form of dissolved and/or suspended solids in the cooling water.

Key equipment items and systems, which would be part of the unique technology of the proposed Piñon Pine Power Project, include the KRW gasifier with in-bed desulfurization, external regenerable sulfur removal, fine particulate filters, and some aspects of the turbine generator. Each of these unique facets of the project are described briefly below, and in greater detail in later parts of this section. Advanced KRW gasification technology produces a low-Btu gas, which is used as fuel in a combined-cycle power plant, and includes hot gas removal of particulates and sulfur compounds from the fuel gas, resulting in lower atmospheric emissions. Desulfurization and particulate removal would be carried out at an elevated temperature to eliminate the inefficiency of (and capital cost for) cooling and cleaning the gas at low temperature, which is associated with other IGCC systems. Since water vapor is not condensed in the hot gas cleanup process, water effluents would be reduced and would consist only of a feedwater treating system effluent and boiler and cooling tower blowdown. The KRW gasification and hot gas cleanup technologies were developed at a 25-ton-per-day pilot plant constructed in Waltz Mill, PA, where more than a decade of gasification testing has taken place. *During this period, more than 13,000 hours of operation were accumulated on the KRW process development unit, generating much data on a variety of feedstocks and operating conditions. The data and models available for scale-up design were developed through operation of the Waltz Mill Process Development Unit.* The Waltz Mill tests suggest that there are no environmental, health, or safety effects that would limit the commercial applicability of the KRW process; commercially available technologies and procedures should be acceptable for treating and disposing of waste streams according to current regulatory requirements (Radian Corporation, 1985). *The gasification process would be a primary component of the proposed project to be demonstrated. A gasification island upset could be caused by abnormal operations conditions, interruption of feed (coal, steam, and air), loss of utilities, such as power or cooling water failure, and/or performance failure of the machinery and equipment. Plant components would be monitored on a continuous basis by the instrumentation provided and would alert the operator should operating conditions deviate from desired value. Depending on the nature of the upset, corrective action would be taken to mitigate the problem, either by adjusting the operating conditions or by safe shutdown of the plant (if the problem persists). These corrective actions would be activated automatically by the plant's instrumentation and control system, but could also be controlled manually*

*if it were necessary for the operator to intervene. During a gasifier island shutdown, equipment would be depressurized by venting the contained fuel gas to the flare to ensure that unburnt fuel would not escape into the atmosphere. Any trip of the gas turbine would lead to automatic shutdown of the gasifier island. Operations during upset conditions would be monitored under state regulation (NAC 445.667), which requires notification of all upset episodes. This notification must include a description of steps taken to limit the malfunction and measures implemented to prevent a recurrence.*

A detailed description of the technology is provided in the Supplement to the Environmental Information Volume (EIV), which was prepared by SPPCo. and is publicly available in the reading rooms (see Appendix H).

### 2.1.3 Project Description

During the operation of the proposed Piñon Pine Power Plant, the predominant fuel would be low-sulfur coals from the western United States. Western coals would be sub-bituminous/bituminous coals such as those found in Utah. (High-sulfur (*greater than 1 percent*) coals from areas such as Pennsylvania would be used for a limited-duration (*3-week*) demonstration test, pending approval by the Nevada Division of Environmental Protection (NDEP).) Raw coal would be received at the plant from a unit train consisting of approximately 84 railcars, each of between 100- and 110-ton capacity, arriving approximately once a week. Currently, Southern Pacific Railroad facilities are on site; the railroad line is a main east-west supply route. Upgrading and extending the spur on SPPCo. land would be required for the proposed project.

Coal would be received at an enclosed unloading station and transferred to a raw coal storage facility. The unloading station would consist of two receiving hoppers, each equipped with a vibrating-type unloading feeder that would feed the raw coal onto conveyor systems. All material handling systems would be enclosed and supplied with dust collection systems *and fire suppression equipment* for environmental control. Dust control equipment would be permitted as required by state and Federal regulations. An automatic sampling system would collect a representative sample from each load to determine the quality of coal received. The expected properties of the coal to be used during the demonstration period are listed in Table 2.1.3-1.

Air from the coal and limestone storage, conveying, and crushing areas would be exhausted through *a fabric filter* or similar collectors. Fines (tiny particles) from dust collection would be returned

Table 2.1.3-1. Expected properties of the design coal for the proposed project.

	Typical Expected Range	Most Probable	Worst Case
Btu/lb (as received)	11,250-11,750	11,400	10,400
Sulfur, % (dry basis)	0.35-0.55	0.45	1.0*
Ash, % (dry basis)	7-11	10.0	13
Moisture, %	7-14	10.0	12
lb Sulfur/10 <sup>6</sup> Btu	--	0.39	0.95*

\*Eastern coal planned for short-term testing differs from the primary feed coal from Utah in that it has less water, less oxygen, more sulfur, and a higher heating value.

to the storage or handling system and later used as fuel. The coal would be stored in one large field-erected storage facility that would be sized to store over 16,000 tons of coal. This structure would have the capacity to store a 20-day supply of coal. The storage facility would be equipped with vent filters to control dust emissions.

Material in the raw coal storage facility would be reclaimed by the automated coal pile reclaimer or discharged by emergency pile dischargers and vibratory feeders onto the covered raw coal collecting conveyor. This covered conveyor would transfer the coal to the coal crushing, drying, and screening area.

In coal crushing, the raw coal would pass through a magnetic separator to remove tramp iron and would be fed to the *crusher* mill feed bin. From the feed bin, the raw coal would be fed at a controlled rate into the dryer mill, which would consist of a grinding chamber and spinner separator. The feed would be introduced above the crushing zone where high-velocity hot gas would convey the coal while drying it. Large particles would fall into the grinding chamber for reduction and would be redirected upward by crusher hammers to the spinner separator for sizing. Oversize material would be returned to

the grinding chamber for further size reduction. The product-sized material would be removed via a cyclone-type separator, conveyed away, and deposited in the coal storage silo.

Air from the cyclone would be recycled through the system; a portion would be vented to the atmosphere through a fabric filter. Airborne fines remaining entrained in the final exhaust gas also would be removed by a fabric filter. These fines and the fines from other dust collection systems would be conveyed to the storage facility for future use, by a completely enclosed pneumatic conveying system.

Dried coke breeze (carbonaceous residue produced from the destructive distillation of coal in the preparation of metallurgical coke) would be received at the plant via trucks with pneumatic trailers for initial plant start-up and for each subsequent gasifier start-up. The coke breeze would be conveyed pneumatically to an 800-ton capacity coke storage silo using the truck-trailer's own pneumatic blower. Exhaust air from the filling operation would be vented through a dust control filter system. The material from the coke silo would be conveyed to the gasifier utilizing the coal conveyor system.

Sized limestone would be received at the plant on a daily basis via trucks with pneumatic trailers. The sized limestone would be conveyed pneumatically to a limestone storage silo *with 300 tons capacity* using the truck-trailer's pneumatic blower. Exhaust air from this filling operation would be vented through a dust control filter system. The material from the limestone silo then would be fed at a controlled rate by a weigh feeder and blended with the coal on the same conveying line that feeds the gasifier island. Provisions would be included to feed additional limestone via a covered conveyor directly to the sulfator, if required.

Coal and coke storage facilities, crushing operation, and pneumatic conveying of coal would be maintained under controlled atmospheres to minimize the possibility of spontaneous combustion. Coal and limestone (as well as coke breeze used during start-up) would be fed from a single enclosed conveyor to the atmospheric feed surge bin, which would be equipped with a vent filter to capture fugitive dust. This bin periodically would discharge solids into the feed pressurization hopper. After pressurization, solids would be transferred from the feed pressurization hopper to the feed hopper.

The feed hopper would provide a continuous feed of coal and limestone to the gasifier through the coal feeder. Coal would be gasified in a KRW 295 psia (20.74 kilograms-force/cm<sup>2</sup>), pressurized, fluidized-bed gasifier, which is a refractory-lined carbon steel pressure vessel, divided into a number of functional zones, where the processes of coal-devolatilization (leading to char formation), partial

combustion, gasification, and LASH and spent-sorbent cooling would occur. Microscopic amounts of the zinc-based sorbent could also potentially be released back from the sulfator, where it would combine with the LASH. A start-up heater (a natural gas-fired or propane-fired heater) would provide hot air necessary for the initial heat-up of the gasifier. Propane could be used as an auxiliary fuel if natural gas were to be curtailed. The gasifier would be designed to operate with a wide variety of coals.

Within the gasifier, combustion of char and gas would occur to provide the heat necessary for endothermic devolatilization, gasification, and desulfurization chemical reactions. The unique geometry of KRW gasifier bed design and the resultant efficient removal of coal ash would facilitate rapid, efficient high-temperature combustion because sufficient oxygen would be readily available in the region of the bed where the coal would actually be combusted. Extraction steam from the steam turbine also would be injected at the gasifier grid to aid in fluidization of the gasifier bed.

Carbon monoxide (CO) and hydrogen gas (H<sub>2</sub>) would form the major combustible constituents of the product gas. Methane and other hydrocarbons would be produced in lesser quantities, primarily from the devolatilization process. Coal contains significant levels of entrained/recoverable oils having the consistency of road tars used for paving. Upon heating these oils above 427°C (800°F), they decompose or "crack" to lighter consistency liquids comparable to diesel or fuel oils, which, when generically grouped, are called cracked tars. The operating temperature of the gasifier would be sufficiently high to crack tars or oils that might be produced.

Gasification also would result in the release of sulfur (S) from the coal, primarily in the form of hydrogen sulfide (H<sub>2</sub>S). Again, the unique KRW gasifier design and its consequent high-temperature coal combustion in the presence of calcium oxide (CaO), would result in rapid contact and capture of sulfur within the gasifier as the sulfur was released from the coal. Use of the proposed low-sulfur coal should result in approximately 50 percent of the sulfur (S) released from the coal being captured in the gasifier by reaction with calcium oxide (CaO). Sulfur (S) exiting the gasifier in gaseous form would be captured by the external zinc-based desulfurizer. The regenerable sorbent proposed for the external desulfurizer would also be unique to this project, because it would rapidly capture exiting sulfur gas and reduce generation of wastes because the sorbent is regenerable. This would result in both resource conservation and pollution prevention.

The product gas exiting from the top of the gasifier would contain entrained solids consisting of char, ash, and sorbent. The gas would enter the gasifier cyclone, which would remove most of the

solids; then, the gas would be directed to the gas coolers for heat recovery. Unique design of the cyclone would result in greater capture of fine particulates. The collected particulates from the cyclone would be returned to the gasifier bed to ensure *increased* combustion. Recycled gas from the recycle gas compressor would be used to facilitate the flow of solids back to the gasifier bed. Recycled gas also would be used to provide fluidization gas and to cool spent solids in the bottom of the gasifier.

As the carbon in char is consumed in the gasifier, the particles would become enriched in ash. These ash particles would tend to agglomerate and, along with dense calcium sulfide/oxide particles, separate from the char bed because of different density and fluidization characteristics. This separation would occur in the region surrounding the central feed tube at the bottom of the gasifier. Spent solids leaving the gasifier would be transferred via the ash feeder to the ash depressurization collection hopper and then transported to the sulfator by a *cooled* recycled gas stream.

The gasifier steam drum would be supplied by boiler feedwater. The steam from the gasifier steam drum would be combined with steam from the sulfator steam drum, superheated in the sulfator, and sent to the steam *turbine* generator. Some of the blowdown from the gasifier steam drum and the sulfator steam drum would be combined and returned to the steam generators; the remaining blowdown would be sent to the proposed evaporation pond.

*The cooled gas product would be treated for removal of gaseous sulfur compounds in the external gas desulfurization system. Product gas from the product gas cooler would be fed to the desulfurizer at approximately 538°C (1,000°F) to reduce sulfur compounds in the fuel gas to 20 ppmv by a zinc oxide-based sorbent. The sulfided sorbent would be regenerated by oxidation with preheated air. The regeneration reactions would be highly exothermic; regeneration gas would be cooled and then sent to the sulfator for SO<sub>2</sub> capture.*

*Desulfurized product gas from the desulfurized section still would contain a small quantity of particles. This stream would be sent to the hot gas filter which essentially would remove all of the particulates. The particulate free desulfurized gas would exit the hot gas filter and be sent to the gas turbine.*

*The filter elements of the hot gas filter would be cleaned with recycle gas. Fines removed by the filter elements would be collected in the bottom of the filter vessel and discharged through the filter*

*fines screw cooler which would cool the fines prior to discharging them into the filter fines collection hopper.*

*Parallel systems of collection hoppers, depressurization hoppers, and feed hoppers would be used to transport the filter fines and gasifier ash to the fines combustor and the sulfator respectively, for final treatment. The solids would be received in collection hoppers, depressurized in the depressurization hoppers, and finally fed to the fines combustor or sulfator from the feed hoppers using recycle gas as a conveying medium. Recycle gas used for pressurization of hoppers would also be vented to the sulfator.*

*With the exception of a small quantity of sulfur in the fuel gas to the gas turbine, all of the sulfur in the coal would ultimately be disposed of in the sulfator system. This system would serve the following functions:*

- Combustion of residual char in the ash and fines collected from gasification;*
- Capture of SO<sub>2</sub> from both the residual char combustion and the desulfurizer regeneration effluent gas; and*
- Oxidation of calcium sulfide (CaS) produced in the gasifier to calcium sulfate.*

*All of these reactions would be highly exothermic and may not proceed to completion. Also, a small recycle gas stream (transport and pressurization gas) would be combusted in the sulfator.*

*The sulfator would be a bubbling bed vessel that would be fluidized by air supplied by the sulfator air compressor. Solids exiting the gasifier bottom containing unconverted calcined limestone, sulfided limestone, and limestone-containing ash (LASH) would be conveyed to the sulfator with the cooled recycle gas from the recycle gas cooler. Regeneration effluent gas from the zinc oxide-based desulfurization system also would be fed to the sulfator for capture of SO<sub>2</sub> by reaction with the unconverted calcined limestone in the solids from the gasifier. Provision would be made to add fresh limestone to the sulfator. The sulfator would be operated at essentially atmospheric pressure. In order to maximize SO<sub>2</sub> capture and sulfur oxidation, the sulfator temperature would be maintained at about 871°C (1,600°F). This would be accomplished by generating saturated steam in the primary solids cooler.*

*Filter fines would be conveyed by a stream of recycle gas to the fines combustor where carbon would be burned for additional heat recovery. Air for combustion of solids, for any supplemental fuel firing in the combustor, and for limiting the temperature to about 871°C (1,600°F) would be supplied by a blower.*

*Flue gas leaving the sulfator would pass through the sulfator cyclone for removal of particulates and then would be mixed with flue gas from the fines combustor prior to cooling in the heat recovery steam generator (HRSG) to about 149°C (300°F). Gas cooling in the HRSG would be accomplished by generating the superheating steam and preheating of boiler feed water. The flue gas then would pass through the sulfator flue gas baghouse filter for final removal of particulates and be sent to the stack.*

*The gas then would pass through the baghouse for final removal of particulates and sent to the stack. Solids leaving the bottom of the sulfator would be cooled and then combined with solids collected in the sulfator flue gas baghouse filter for transfer to a disposal site.*

A General Electric (GE) combustion turbine engine has been selected for the proposed combined-cycle Piñon Pine Power Project to convert the fuel gas produced by the gasification section into electric power. It is an industrial frame-type combustion turbine, with a technologically advanced firing temperature and cooling system. Its unique design provides units operating in combined cycle power plants with the highest total efficiency of any proven type of fossil-fueled electric power generation system. This would allow greater energy generation using less fuel.

The heat recovery steam generator (HRSG) would generate steam at *two* pressure levels, 1,020 (71.7 kilograms-force/cm<sup>2</sup>) pounds per square inch absolute (psia), *and* 90 psia (6.33 kilograms-force/cm<sup>2</sup>). Steam generated in the HRSG at 1,020 psia (71.7 kilograms-force/cm<sup>2</sup>), and high-pressure steam generated in the gasifier island, would be combined, superheated in the HRSG to 510°C (950°F) at 955 psia (67.17 kilograms-force/cm<sup>2</sup>), and sent to the steam turbine generator for expansion. The 90 psia (6.33 kilograms-force/cm<sup>2</sup>) steam generated would provide steam to the deaerator and admission to the steam turbine.

The steam turbine would have one steam *extraction* and one steam *admission*, *in addition to the main steam inlet and the exhaust to the condenser*. The extraction at 460 psia (32.34 kilograms-force/cm<sup>2</sup>) would provide steam to the gasifier. *In addition to the main steam supply at 950 psia and*

510°C (950°F), the HRSG would provide 90 psia (6.33 kilograms-force/cm<sup>2</sup>) input steam to the steam turbine. The steam turbine and generator would be of conventional design.

The steam turbine would exhaust into a conventional surface condenser. Cooling water would condense the exhaust steam. Condensate would be pumped from the condenser; venting of the condenser would be accomplished by a steam jet air ejector system or vacuum pump system. Wastewater from boiler and cooling tower blowdown reject would be discharged to a new double-lined evaporation pond (see Table 2.1.3-2), designed to meet the Nevada Division of Environmental Protection (NDEP) *guidelines*. The new evaporation pond for the proposed Piñon Pine Power Project would be equipped with floating spray units that would draw water from the pond's surface and spray it into the air above the pond to increase the effective surface area of the pond, and as a result, improve the evaporation rate.

*In addition, a nitrogen plant would be constructed, if needed, to produce the nitrogen for regeneration of the sulfur-absorbing sorbent, maintaining a constant flow of purge gas through selected equipment and instruments, cleaning of the hot gas filter (when normal gas is unavailable), pneumatically conveying coal dust, and performing system purging at shutdown. It would be a cryogenic air separation plant where the constituents of air would be separated by cryogenic distillation to deliver high purity nitrogen in the required quantity and would include compressors, storage tanks, a liquid nitrogen pump, and vaporizers sized to provide for startup, normal operation, and safe shutdown. It would operate approximately 6 hours per day, 7 days per week. The plant would not be a source of air emissions, would not consume additional water, and would produce approximately 90 dB at 3 meters (15 feet).*

*The capacity of the existing septic system at the Tracy Station would meet the requirements of the proposed project. The system was constructed as a soil absorption system and meets appropriate distance requirements for streams or watercourses and water supply wells.*

Cooled solid waste (LASH) consisting of ash, fines, *attrited zinc-based desulfurization sorbent*, and sulfated limestone from the sulfation unit would be conveyed continuously to the solid waste storage silo using a belt conveyor system. The air displaced from the silo and the conveyor would be vented through the bin filter. The solid waste silo would be designed to have a 5-day storage capacity. The current plan would be to transport the LASH by truck for disposal at a local landfill; however, various reuse options for the LASH are being investigated and are discussed in section 4.1.10 and 4.3.2.3.

Table 2.1.3-2. Estimated discharges to ponds from the proposed Piñon Pine Power Project.

DISCHARGES TO THE COOLING POND			
Source	Estimated Flow	Process	Comments
Floor drains	Floor drains tied to existing plant floor drains; a normal flow of zero is expected except when washing a floor or draining a feed water heater or oil cooler.	Water can be well water, condensate, or circulating water (cooling pond water).	Oil trapped in the oil separators is collected for recycling.
DISCHARGES TO EXISTING EVAPORATION POND			
Source	Estimated Flow	Process	Comments
NONE			
DISCHARGES TO NEW EVAPORATION POND			
Source	Estimated Flow	Process	Comments
Demineralizer wastewater	6 acre-feet/year (4 gpm)	Comes from regenerating the demineralizer.	Would be treated with caustic on some and sulfuric acid on others but would be Ph neutral when entering the pond. <i>(Treatment options are being explored to reduce plant cooling water needs by re-use of these waste streams, if economically feasible.)</i>
Steam cycle blowdown	16 acre-feet/year (10 gpm)	Comes from steam cycle blowdown.	
Cooling tower blowdown	85 acre-feet/year (53 gpm)	Comes from cooling tower blowdown after recovery.	
Drains from selected areas	Flows would be minimal.		Drains from selected areas would be routed to the new evaporation pond.

Well water would be the source of water for the plant's raw water system. The raw water system would provide water to the demineralization package, which in turn would provide boiler feedwater make-up to the deaerator. The raw water system also would provide water for the plant utility water system for miscellaneous uses, such as service wash stations. Well water would be pumped to the existing Unit 3 raw water tank and then pumped to the plant raw water system. While the Truckee River is the main contributor to groundwater flows in the overall region where the Truckee River flows, in the immediate vicinity of the well, a flooded gravel pit and the existing SPPCo. cooling pond may potentially provide additional groundwater recharge.

Approximately 1.4 cfs of surface water from the Truckee River would provide make-up water for the cooling tower. Raw water would be pumped from the existing river water intake to the cooling tower basin. A conventional induced-draft counter-flow cooling tower would be used for the plant cooling water system; the basin would be below grade.

Water for safety showers and eyewashes would be provided by wells using the existing system. Drinking water would be provided as a brought-in bottled source. Because the water quality in existing Well No. 1 is not sufficient, *it cannot be used* for make-up or the demineralizer and does not meet drinking water standards, a new well *near the maintenance shops* will be drilled in 1994. This new well is not considered part of the proposed action. However, if the well produces potable water, bottled water will be discontinued as a source of drinking water. Water from this new well also will be used for domestic and general plant uses. Fire protection water would be provided by the existing plant system, which currently supplies 4,000 gpm to the fire protection water loop. The current source of fire protection water is the existing cooling pond. Three fire protection water pumps are presently installed together with a jockey pump.

Blowdown from the system would be sent to the proposed *double-lined* evaporation pond. Blowdown is rapid depressurization, usually inside a vessel similar to a knockout drum, which is frequently done to rapidly cool and remove impurities in a gas stream. Corrosion inhibitors, additives, Ph controllers, biocides, and scale/deposit inhibitors would be injected into the cooling tower water by the water treatment injection system, as needed. *The double liner system would consist of high density polyethylene or similar material over a layer of very low permeability clay or geosynthetic fabric. Monitoring wells would be installed to detect any leakage from the evaporation pond before contamination would reach the river. The evaporation pond would be constructed in compliance with NDEP guidelines.*

A conventional plant and instrument air compression system would be provided. Two air compressors (one operating and one spare) would be provided for the system. Plant air would be reduced or cut off if excessive pressure loss was sensed in the instrument air header.

A flare system is incorporated in the design to combust coal gas from the gasifier in the event of a power plant trip, during gasifier start-up, or for other short-duration, non-steady state conditions. Pilots of the flare would be designed to use natural gas or propane. The flare system would be designed to accept the maximum coal gas output from the gasifier and would be expected to operate up to 48 hours per start-up with 3 to 4 start-ups per year. The flare would be designed as a vertical free-standing unit that would allow condensed moisture to be drained from the fuel vent line. The stack height would be 7.5 meters (25 feet) with an inside diameter of 1.2 meters (4 feet). A discussion of noise associated with the start up and/or the flare is found in section 4.1.11.

Liquid propane is planned as the tertiary fuel for the combustion turbine. Fuel would be delivered by tank truck or tank car and stored in two 100,000-gallon storage tanks. The tanks would be oriented, and earthen berms constructed, to minimize damage in the event of tank failure. Storage would be in accordance with applicable National Fire Protection Association (NFPA) requirements. When required, liquid propane would be drawn off the storage tanks and pumped to the plant area. The liquid propane would then be vaporized for use as a gaseous fuel for the combustion turbine.

The existing Tracy substation supplies electricity at 120 kilovolts (kV) to SPPCo. Connection to this system would be through tie and service breakers to unit-type transformers connected to the combustion turbine and steam turbine generators. The generators would be rated at 13.8 Kv. The transformer base rating would approximately equal the net generator output. The elevated temperature and/or the auxiliary cooling transformer rating would approximately equal the maximum generator output. Station service power would be fed from one or both generator transformers or an auxiliary station service transformer supplying 4.16 kV to large motors and to step-down transformers [4.16 kV to 480 volts (V)] for general distribution. Metering would take place on the 120-kV system for assessment. To coordinate between the SPPCo. system and internal users, protection would be arranged as required. Auxiliary systems within the plant would be provided through uninterruptable power supplies (UPS) or direct current (DC) batteries to support personnel safety and critical equipment during shutdowns or power outages, where necessary.

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Because of the relatively mild site temperatures, the use of enclosures would be minimal. The steam turbine generator along with its auxiliary components would be housed in one enclosure. The water-treating facilities would be housed in a second enclosure. The gasifier would be supported in a steel structure but would not be enclosed. Additional enclosures would be provided for equipment; existing buildings would be modified, as appropriate. Outside rotating equipment would be provided as totally enclosed fan-cooled systems or with equivalent protection. Existing buildings would be used for spare parts storage, shops, and operator facilities. The existing Unit 3 control room would be equipped to accommodate the proposed plant's control needs. Heated enclosures also would be provided for the deaerator level controls, steam drum level controls, and any other system where freezing conditions may cause service interruptions.

General operation characteristics of the proposed Piñon Pine Power Project are presented in Table 2.1.3-3.

An in-depth environmental health and safety data base was developed for the proposed plant by using liquid, solid, and potential atmospheric discharge data from the Waltz Mill Plant constructed in Waltz Mill, PA. For the conventional pilot plant test, the resultant solid wastes were non-hazardous as defined by the Resource Conservation and Recovery Act (RCRA). The work space air was found to be of generally acceptable quality, with minimal emissions of  $H_2S$ , CO, and particulates. No heavy metals and no contaminant levels were found that would cause significant concern for workers using proper environmental controls. The same acceptable worker environment is expected for the proposed Piñon Pine Power Project.

Air emissions generated from the proposed project would include CO,  $NO_x$ ,  $SO_2$ ,  $PM_{10}$ , and hydrocarbons; emissions also would be generated in the form of exhaust from employee vehicles. As a result of the proposed project, some increase in the production of fog in the canyon could be expected during cold weather.

Stormwater runoff, if any, from the proposed site would be routed to the cooling pond. Wastewater discharges would be discharged to a new, *double*-lined evaporation pond. These discharges would include nonrecycled cooling tower blowdown; blowdown from the gasifier, sulfator, and HRSG; reconcentration waste from the demineralization package; and some discharges from miscellaneous facility components. Sanitary wastewater discharges generated at the proposed facility would be directed to the septic system.

**Table 2.1.3-3. Expected operating characteristics of the proposed Piñon Pine Power Project at full load, 100% capacity factor.**

	Piñon Pine Power Project
Capacity, MW	104 Gross 95 Net
Capacity Factor, %	100
Power Production MWh/yr	832,200
<i>Heat Input (Btu/hr)</i>	<i>835,000,000</i>
Size of Site, Acres	724
Fuel Consumption per yr (816 tons/day of coal expected, full load consumption rate), air dried basis	297,840 tons
Limestone	21,900 tons
Water Consumption, cfs	
Cooling Tower (surface water)	1.522
Demineralizer (groundwater)	0.145
Utility Stations (groundwater)	0.001
Air Emissions	
Sulfur Dioxide, tons/yr <sup>1</sup>	225
Oxides of Nitrogen, tons/yr <sup>1</sup>	575
Particulate Matter, tons/yr <sup>1</sup>	123
Carbon Monoxide, tons/yr <sup>1</sup>	304
Carbon Dioxide, tons/yr	790,000
Effluent (cfs)	
Cooling Tower (surface water)	0.117
Evaporation & Drift	1.412
Demineralizer Waste (groundwater)	0.0082
Gasifier Steam Waste	0.0732
Solid Waste	48,545
LASH, tons/yr	
<sup>1</sup> Assuming annual average ambient temperature of 10°C (50°F) and maximum design coal capacity of 880 tons/day (air dried basis).	

Solid waste generated would consist of a spent lime, gypsum, and ash mixture (LASH) suitable for landfill disposal; barrier filters and spent sorbent from the external hot gas desulfurization reactors; and domestic waste. Small quantities of hazardous wastes would be generated by the proposed project including acetone, spent non-halogenated solvents, and waste oil. Waste zinc-based desulfurization sorbent would also be generated (see also section 4.1.10). Hazardous wastes associated with the operation of the project would be transported and disposed of in accordance with Subtitle C of RCRA.

To summarize, the proposed action would include:

- Construction and operation of the IGCC facility encompassing
  - coal solids handling and drying facility
  - limestone handling facility
  - conveyors
  - gasifier
  - ash-handling facility
  - combustion turbine and generator
  - heat recovery steam generator (HRSG)
  - flare stack
  - steam turbine and generator
  - particulate collection systems for fuel, flue gas, and material handling equipment
- Construction of silos for coal, ash, coke, and limestone
- Construction of raw coal storage facility
- Construction of flue gas stacks
- Construction of a new primary switchyard
- Refit of the control room and other modifications to existing buildings, as necessary
- Continuation of the rail spur
- Upgrades to the existing rail track
- Installation of propane storage tanks
- Construction of a cooling tower
- Construction of a *double*-lined evaporation/wastewater pond
- *Construction of a nitrogen processing plant, if needed*

## **2.2 Alternatives**

Section 102 of NEPA requires that agencies discuss the reasonable alternatives to the proposed action in an Environmental Impact Statement (EIS). The term "reasonable alternatives" is not self-defining, but rather must be determined in the context of the statutory purpose expressed by the underlying legislation. The goals of the Federal action establish the limits of its reasonable alternatives. Congress established a very specific goal for this phase of the CCT Program — to demonstrate innovative, energy-efficient coal technologies capable of achieving substantial reductions in SO<sub>2</sub> and NO<sub>x</sub>. DOE's purpose in selecting the Piñon Pine Power Project is to demonstrate that air-blown fluidized-bed coal gasification technology incorporating hot gas cleanup will provide higher thermal efficiency (because it consumes less auxiliary power) than similar oxygen-blown IGCC systems. Reasonable alternatives to this proposed action must be capable of meeting this purpose.

DOE recognizes that a wide range of options are available that would reduce emissions of acid rain precursors and greenhouse gases and could be considered as alternative actions to replace or augment the CCT Program. These options include nuclear energy, natural gas, renewable energy sources, and conservation. DOE has provided extensive support toward developing and demonstrating the benefits of alternative fuels, renewable forms of energy, and conservation. However, these alternatives would not achieve the goals of the CCT Program and consequently are beyond the scope of this document. Alternative coal-fired technologies were evaluated as part of the CCT Program's overall strategy for compliance with NEPA. Alternative coal-based technologies proposed by other participants that were selected for demonstration are subject to separate site-specific environmental analyses. These projects are not alternatives to one another.

SPPCo. conceived, designed, and proposed the Piñon Pine Power Project in response to the PON issued by DOE in January 1991 (see section 1.1) for soliciting proposals. The proposed Piñon Pine Power Project was selected to demonstrate a particular type of technology; other CCT projects would not achieve this goal. DOE's role is limited to providing cost-shared Federal funding support for SPPCo.'s proposed project. As such, the range of alternatives that meet the goals of demonstration is narrower because of the proposal selection process DOE must follow by law.

Congress also directed DOE to pursue the goals of the legislation by means of partial funding of projects owned and controlled by nonfederal-government sponsors. This statutory requirement places DOE in a much more limited role than if the Federal government were the owner and operator of the

project. In the latter situation, DOE would be responsible for a comprehensive review of reasonable alternatives for siting the project. However, in dealing with an applicant, the scope of alternatives is necessarily more restricted because the Department must focus on alternative ways to accomplish its purpose that reflect both the application before it and the functions it plays in the decisional process. It is appropriate in such cases for DOE to give substantial weight to the applicant's needs in establishing a project's reasonable alternatives.

### 2.2.1 Alternative Sites

DOE is not the owner-operator of the proposed project under consideration. Therefore, DOE's evaluation of the project's reasonable site alternatives is focused on a review of the site selection study and criteria prepared by SPPCo.

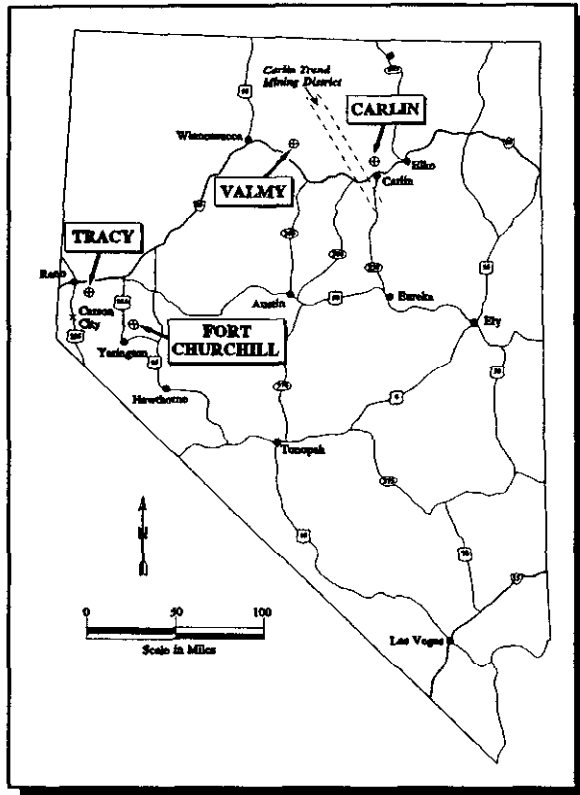


Figure 2.2.1-1. Alternative site locations.

disadvantages to building a plant in this area. There currently are no natural gas facilities, electrical substations, office buildings, control rooms, or warehouses in the area, and approximately twice as many

SPPCo. conducted a preliminary site selection study before submitting its proposal to DOE and included its analysis in the EIV, which is available in the reading rooms (see Appendix H). Four potential locations for SPPCo.'s proposed IGCC project were considered (see Figure 2.2.1-1):

1. Fort Churchill Power Plant
2. North Valmy Power Plant
3. Tracy Power Station
4. Carlin, Nevada

The Carlin area was the only location that did not have existing generating facilities. This location was included because of large-scale mining operation customers in the vicinity. Although adequate transmission capabilities currently exist and selection of a site in the area would improve the export limit of SPPCo.'s electrical system, there also were major

additional employees would be required compared to the other candidate sites. Consequently, a specific site in the Carlin area was not pursued and no further analysis of the area was conducted.

On a more quantitative and specific level, SPPCo. evaluated the three remaining sites on the basis of environmental, socioeconomic, engineering, and cost factors. These three major generating sites were considered because use of an existing generating station would reduce the construction costs of common facilities such as warehouses, substations, parking lots, and office buildings, and because an existing station would require fewer additional employees.

The Fort Churchill Power Station is located in rural Mason Valley in Lyon County, approximately 121 km (75 highway miles) southeast of Reno. Although located on U.S. Alternate Route 95, a two-lane highway from Fernley to Yerington, NV, Fort Churchill is a considerable distance from a major interstate highway. The need to provide a sufficient labor pool and accommodations for workers during the construction phase could put a strain on local resources. SPPCo. estimated that the majority of the construction workers would commute approximately 3 hours (round trip) per day. However, the additional manpower required for operation could be recruited easily from within the community and this employment would have a positive effect on the local economy. The station currently has two units operated by a single control room. The existing control room could not be refitted to accommodate the proposed Piñon Pine Power Project, therefore, it would be necessary to construct a new control room to operate the proposed facility. In addition, existing transmission capabilities from the Fort Churchill Power Plant to the large customer base (and load center) in the Reno area are limited.

North Valmy is located near the Carlin Trend in north-central northeastern Nevada. This area is experiencing rapid growth from gold mining activity. Currently, there are shortages of schools, housing, medical facilities, and skilled labor. Construction of the Piñon Pine Power Project at this site would further strain these resources. SPPCo. believed that having the option to use a fuel alternative was especially important for a demonstration technology, such as a gasifier, given that the gas production from coal might not be available at all times. The North Valmy Power Plant does not have access to a natural gas line, thus eliminating natural gas as a fuel alternative. Emergency and start-up fuels would need to be supplied by the construction of propane tanks at a higher cost. The station has more than 500 MW of generating capacity, and increasing the capacity of this facility could tend to decrease the overall reliability of SPPCo.'s electrical system. The station currently has two units operated by a single control room; therefore, it would be necessary to construct a new control room to operate the proposed facility.

SPPCo.'s environmental evaluation of the candidate sites considered the potential for regulatory noncompliance and potential impacts. The parameters evaluated included:

- Water resources;
- Air quality and meteorology;
- Terrestrial and aquatic ecology; and
- Land use (cultural and aesthetic values).

Each factor was evaluated in terms of specific criteria, and subjective professional judgment was used to assign numerical ratings to each parameter. The criteria included the following:

- Determination of an overall rating for water quality based on the proximity to surface water and groundwater aquifers, site characteristics, and existing operations;
- Determination of air quality based on existing studies and data related to climatology, wind patterns, proximity to nonattainment areas, and other competing uses in the airshed;
- Terrestrial ecology ratings based on potential species diversity and proximity to wildlife management areas and other surrounding land-use activities, which provide a diverse habitat. Aquatic ecology was evaluated on the basis of proximity to surface water and wetlands. Potential effects of the project on water quality and species diversity within the aquatic and stream environmental zones were considered; and
- Cultural and aesthetic ratings based on regional land use, development, site characteristics (disturbance), and the historic and cultural significance of the area.

The lowest adverse impact was represented by a 10; the highest adverse impact was represented by a 0; higher total scores represented greater environmental acceptability. All of the sites considered were judged by SPPCo. to be acceptable from an environmental perspective. Results of SPPCo.'s environmental analysis are presented in Table 2.2.1-1.

**Table 2.2.1-1. Results of SPPCo.'s environmental evaluation of alternative sites.**

	Tracy	Fort Churchill	North Valmy
Water Quality	8	6	8
Terrestrial and Aquatic Ecology	6	5	8
Air Quality	7	8	7
Land Use (Cultural and Aesthetic Values)	9	5	9
<b>TOTAL (possible 40)*</b>	<b>30</b>	<b>24</b>	<b>32</b>

\*The higher scores represent greater environmental acceptability.

SPPCo. also subjectively ranked economic and reliability data for each site. The factors considered in providing a numerical ranking were as follows.

- **Natural Gas Supply:** Proximity to gas transmission lines and availability of capacity on the lines.
- **Coal Handling:** Proximity of mainline quality trackage and any existing coal handling facilities.
- **Oil Storage:** Existence of available tank(s) and proximity to bulk supply.
- **Waste Storage:** Availability of land and existing permits and facilities.
- **Existing Control Room:** Space in existing manned control room.
- **Existing Substation:** Amount of expansion required to serve facility.
- **Support Facilities:** Existing offices, shops, and similar infrastructure.

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- **Transmission Considerations:** Contribution to system's dynamic stability or avoidance of additional transmission lines to serve existing or expected customers.
- **Construction Cost:** Proximity to labor markets, rail and highway access, and existing infrastructure.

Best possible conditions were represented by a 10, and worst possible conditions were represented by a 1. The results are shown in Table 2.2.1-2.

**Table 2.2.1-2. SPPCo.'s relative rating of economic and reliability issues pertaining to alternative sites.**

	Tracy	Fort Churchill	North Valmy
Natural Gas Supply	9	9	1
Coal Handling	8	6	9
Oil Storage	9	7	5
Waste Storage	6	4	8
Existing Control Room	9	1	1
Existing Substation	9	9	9
Support Facilities	9	7	8
Transmission Considerations	8	6	5
Construction Cost	9	7	6
<b>TOTAL (possible 90)*</b>	<b>76</b>	<b>56</b>	<b>52</b>

\*The higher numbers represent greater acceptability.

SPPCo. scored the Tracy site higher than other candidate sites because of the following determinations:

- The interface between the proposed gasification project and existing facilities would be better at the Tracy site than at other sites;
- The site was originally designed for the possibility of converting to coal;

- The Tracy Power station has three units operated by two control rooms. The second control room (for Unit 3) could be equipped to accommodate the control requirements of the proposed facility;
- There is excellent access by railroad and highway;
- There are sufficient existing water rights and resources to accommodate the proposed project. (The resources were determined to be sufficient by comparing the total industrial water rights issued by the state with the maximum possible water consumption of the proposed Piñon Pine Power Project);
- The site has existing natural gas capability;
- The site is closest to Reno and, therefore, has the largest labor pool from which to draw and would have the lowest construction and operating costs. Construction costs would be reduced because construction materials would be delivered via Interstate 80 and the rail line. The work force would reside in the Reno/Sparks metropolitan area and other nearby communities, thereby reducing travel expenses and subsistence for construction labor. Operating expenses would be minimized because the proposed Piñon Pine Power Project would require fewer operating personnel at Tracy than at other sites. The existing Unit 3 control room could be refitted and the manning schedule revised to include the proposed Piñon Pine Power Project. This would reduce the need for additional staff by approximately 50 percent compared to other sites;
- The site has adequate existing transmission capabilities.

Based on its review of the site analysis conducted by SPPCo., DOE has determined that the proposed Tracy Station site would be the only site that meets SPPCo.'s goals and objectives.

#### **2.2.2 No-Action Alternative**

Under the no-action alternative, DOE would not provide cost-shared funding support for the proposed Piñon Pine Power Project, and the advanced KRW gasification technology with hot gas cleanup probably would not be demonstrated in Reno, NV, or elsewhere because there are no similar proposals

in the CCT Program. The opportunity to demonstrate this technology likely would be lost. Commercialization of the proposed technology would be delayed or not occur at all because utilities and private sector companies would be inclined to choose known and demonstrated technologies rather than new, unproven advancements. Thus, an opportunity for utilities and private industry to select this high-efficiency clean-coal technology, with its ability to lower SO<sub>2</sub> and NO<sub>x</sub> emissions nationwide, may be eliminated.

SPPCo. has stated that without cost-shared funding support from DOE, it would not construct the project as proposed. However, SPPCo. would still need to find a cost-effective means of meeting the projected energy demand of their customers. This increased demand requires the addition of generating capacity by SPPCo. Should the DOE not fund the proposed Piñon Pine Power Project, the "most reasonable" course of action for SPPCo. to pursue would be the construction of essentially the same project, but without the capability of using coal fuel. There would be no plan to continue with the coal gasification project without the support of the DOE. Such a project likely would use natural gas with distillate oil as a secondary fuel source. The no-action alternative described here should not be interpreted as a final decision by SPPCo. A final determination would be made in compliance with the resource planning process required by the state of Nevada. SPPCo. would analyze all possibilities and present their most preferred (least-cost) option to the PSCN; SPPCo. would proceed only after receiving PSCN approval. Although cost factors are studied in order to develop the least cost option, the PSCN decision does not depend solely on least cost as conventionally defined. Externalities (such as environmental and conservation factors) also are considered but not in a direct linear weighting manner with costs. Unless the "externalities" are overwhelmingly negative, costs are the major factor of import in the decision making process, thus minimizing the direct effect on ratepayers. The no-action alternative described and evaluated in this FEIS reflects the most likely SPPCo. course of action at the time of NEPA documentation preparation.

The configuration of a natural gas and distillate oil combined cycle power plant would include the same General Electric combustion turbine and auxiliary equipment selection as described for the proposed Piñon Pine Power Project. A slightly smaller size steam turbine would be utilized. Currently, there is one natural gas pipeline, owned by the Paiute and Southwest Gas companies, that would be used, because of its location, to transport natural gas to the site. However, this pipeline's capacity has had a history of being used to maximum capacity during the winter months. If this continues, gas for power production at the Tracy Power Station would not be available and the use of an alternative fuel (such as propane or distillate oil) would be required. However, if the proposed Tuscarora pipeline is constructed,

natural gas potentially could be used exclusively. The pipeline would end at the property line of the Tracy Power Station. SPPCo. would be responsible for extending the pipeline no more than 15 meters (50 feet). The Federal Energy Regulatory Commission (FERC) is in the process of preparing an EIS for this pipeline; the decision to proceed with the Tuscarora pipeline is independent of any other decision pertaining to the Tracy Power Station.

Based on an ambient operating temperature of 10°C (50°F), the power generation capabilities of the individual units associated with the natural gas power plant would be as follows:

- Combustion Turbine

- Heat Input:  $716.7 \times 10^6$  Btu/hr (HHV)

- Gross Generation: 66.9 MW

- Steam Turbine

- Steam Flow: 167,000 lb/hr at 950 psia (67.17 kilograms-force/cm<sup>2</sup>), 510°C (950°F)

- Gross Generation: 24.6 MW

- Combined Cycle Plant

- Net Generation: 88 MW

- Net Heat Rate: 8,144 Btu/kWH (HHV)

Operation characteristics of SPPCo.'s most reasonable course of action under the no-action alternative are presented in Table 2.2.2-1. The site plan for this project is presented in Figure 2.2.2-1. Proposed costs for the SPPCo.'s "most reasonable" course of action would be proportionally less than the proposed action, reflecting the elimination of coal utilization capabilities. A comparative analysis between the proposed action and the ramifications of the no-action alternative is provided in section 2.3; the potential environmental impacts resulting from the no-action alternative are assessed in section 4.2.

## **2.3 Comparison of Alternatives**

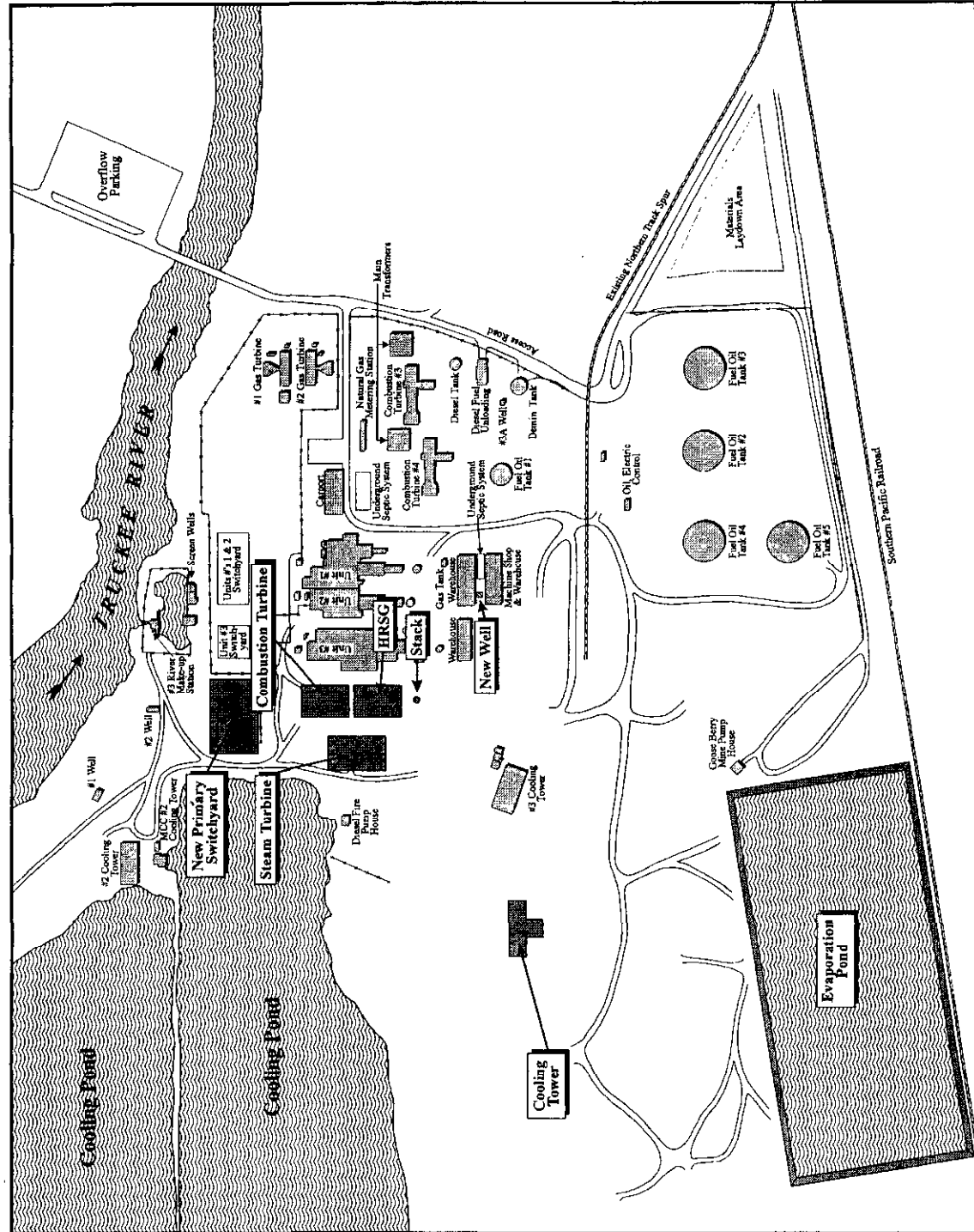
Features of and the potential impacts from the proposed action and the no-action alternative are summarized in Table 2.3-1. Impacts from both the proposed action and the no-action alternative would be similar for aesthetics, land use, cultural resources, and soils and geology. Health and safety impacts would be minimized for both the proposed action and the probable project under the no-action alternative

**Table 2.2.2-1. Expected operating characteristics of plant operation under the no-action alternative.**

	Combined-Cycle Power Plant
Capacity, MW	91 Gross 88 Net
Capacity Factor, %	100
Power Production MWh/yr	770,880
<i>Heat Input (Btu/hr)</i>	<i>716,700,000</i>
Size of Site, Acres	724
Fuel Consumption per yr <sup>1</sup>	14.8 x 10 <sup>6</sup> gal distillate oil 4.0 x 10 <sup>9</sup> ft <sup>3</sup> natural gas
Water Consumption, cfs	
Cooling Tower (surface water)	0.822
Demineralizer (groundwater)	0.275
Utility Stations (groundwater)	0.001
Air Emissions <sup>1</sup>	
Sulfur Dioxide, tons/yr	53
Oxides of Nitrogen, tons/yr	482
Particulate Matter, tons/yr	63
Carbon Monoxide, tons/yr	135
Carbon Dioxide, tons/yr	429,000
Effluent (cfs)	
Cooling Tower (surface water)	0.064
Evaporation & Drift	0.759
Demineralizer Waste (groundwater)	0.015
Steam Injection Waste	0.2634

<sup>1</sup> Assuming 8 months firing natural gas, 4 months firing distillate fuel oil.

**Figure 2.2.2-1. Map of facilities at Tracy Station projected as a result of the no-action alternative.**



by updating health and safety programs and instituting engineering controls; neither is expected to result in an adverse impact to worker or public health and safety. Impacts associated with biological resources would be similar for the two alternatives, but the degree of impact would be less for the probable project resulting from the no-action alternative, because less land would be utilized and less surface water would be consumed. However, groundwater consumption for demineralization is expected to be slightly higher if the no-action alternative were to be selected. Air emissions from the natural gas plant would be less than for the proposed action because the anticipated use of natural gas would result in lower emissions of SO<sub>x</sub>, PM<sub>10</sub>, NO<sub>x</sub>, and CO. Because the resulting project under the no-action alternative would not be burning coal, no LASH would be generated and thus reduction of the projected 122-year lifespan of the Lockwood disposal facility would not be expected. Noise levels from the no-action alternative, the natural gas plant, are expected to be less than those for the proposed action because coal processing equipment would not be required. Adequate labor force, housing, and public services would be available for the proposed action and the probable project under the no-action alternative. The beneficial impact of increased tax revenue would be less if the no-action alternative were selected because fewer construction workers and employees would be required.

**Table 2.3-1. Comparison of the potential impacts from the proposed Piñon Pine Power Project and the no-action alternative.**

	Proposed Action	No-Action Alternative
Technology Description	The KRW gasifier with in-bed desulfurization, external regenerable sulfur removal, fine particulate filters, and aspects of the gas turbine generator would be demonstrated. Goals of the CCT Program would be met with successful demonstration.	KRW gasification technology would not be demonstrated. A conventional combined-cycle plant operated on natural gas and distillate oil (and possibly propane) would probably be built. Goals of the CCT Program would not be met.
Construction Activities	Substantial construction activities would be required. The plant size would be approximately 28 acres.	Construction would occur; the area of land disturbed would be less. The plant size would be approximately 2.6 acres.
<b>Potential Impacts</b>		
Aesthetics	Additional structures added to the existing site would not alter visual quality.	Additional structures added to the existing site would not alter visual quality.
Atmospheric Conditions	Air quality impacts from construction activities would be temporary. Air emission rates anticipated during operation of the proposed facility include 225 TPY of SO <sub>2</sub> , 123 TPY of PM <sub>10</sub> , 575 TPY of NO <sub>x</sub> , and 304 TPY of CO. Modeling results indicate that pollutant levels would be in compliance with the NAAQS and would not have a significant impact on nonattainment areas in the Truckee Meadows. Both Class I and Class II PSD increment analyses indicate no significant degradation of air quality would result. The results of the visibility analysis indicate that visual impacts would be below the screening criteria for all impact categories. <i>Modeling results show a potential increase of, at most, 3 percent in fog episodes.</i>	Construction activities would be temporary; therefore, no long-term adverse air quality impacts are anticipated. Anticipated emissions levels during operation would be less than levels produced from the proposed action. The expected emission rates of 53 TPY of SO <sub>2</sub> , 63 TPY of PM <sub>10</sub> , 482 TPY of NO <sub>x</sub> , and 135 TPY of CO would be in compliance with NAAQS. Visibility impacts would be similar to those anticipated for the proposed action.

Table 2.3-1. Comparison of the potential impacts from the proposed Piñon Pine Power Project and the no-action alternative (continued).

	Proposed Action	No-Action Alternative
Soils and Geology	Proper engineering practices would be required to meet Seismic Zone 4 specifications and to mitigate against possible hazards from building in soils with certain characteristics. An estimated 91,800 cubic meters (120,075 cubic yards) of soil would be displaced during construction. BMPs would be employed to control erosion. No activity is planned that would impact soil quality.	The same engineering practices would be required to meet Seismic Zone 4 specifications and to mitigate against possible hazards from building in soils with certain characteristics. It is estimated that less than 22,800 cubic meters (30,000 cubic yards) of soil (approximately 75 percent less than for the proposed action) would be displaced during construction. No activity is planned that would impact soil quality.
Water Resources	Water use during construction would differ little from present practices; runoff from construction activities would be directed to the cooling pond; BMPs would be implemented to control nonpoint sources of pollution. The increase in water consumption would be relatively small; downstream users would experience a loss of approximately 1.4 cfs (less than 1 percent of current normal Truckee River flows). River water quality should not be impacted by operation because the plant would continue as a "zero discharge" system. Discharges to a new evaporation pond would include cooling tower blowdown (0.117 cfs) and demineralizer waste (0.0082 cfs). A worst-case scenario regarding groundwater usage estimated the impact to be very slight. No facility would be constructed or operated in a wetlands but the switchyard would be expanded within the FEMA-designated 100-year floodplain.	There would be approximately a 34 percent decrease in water consumption compared to the proposed action. Discharges directed to a new evaporation pond would include cooling tower blowdown (0.064 cfs) and demineralizer waste (0.015 cfs). No facility would be constructed or operated in a wetlands but the switchyard would be expanded within the FEMA-designated 100-year floodplain. Other impacts associated with water resources would be similar to those from the proposed action.
Land Use	Since the site is zoned for industrial use, there should be no impact to land use; however, a Special Use Permit would be required. There would be a small increase in traffic during the construction phase.	The same site would be utilized with impacts similar to those discussed for the proposed action. There would be less traffic during construction because fewer workers would be required, and no increase in rail traffic would occur.

**Table 2.3-1. Comparison of the potential impacts from the proposed Piñon Pine Power Project and the no-action alternative (continued).**

	Proposed Action	No-Action Alternative
Biological Resources	<p>Short-term impacts resulting from blowing dust during construction may be expected. A spill and erosion control plan would be implemented to preclude impacts to aquatic ecosystems.</p> <p>Operation of the proposed project would require additional diversion of water; however, withdrawal would result only in an average monthly <i>consumption</i> of approximately 1.4 cfs (less than 1 percent of current normal Truckee River flows). Some wildlife and vegetation would be permanently displaced because of grading and compaction, while others would be temporarily affected because of construction noise and activity.</p> <p>Operation of the Piñon Pine Power Project would result in emissions of SO<sub>x</sub> and NO<sub>x</sub> below foliar threshold values. Threatened and endangered species would not be significantly impacted by the project; the bald eagle's riparian habitat would not be affected.</p>	<p>Because of reduced spatial requirements (2.6 acres compared to 28 acres), there would be the potential for reduced habitat disturbance. There would be a slight <i>decrease</i> in Truckee River diversion (approximately 1 cfs) which would not result in an adverse impact to aquatic ecosystems or threatened and endangered fish species.</p>
Socioeconomic Resources	<p>No significant adverse socioeconomic impacts are anticipated to be associated with the proposed project. Adequate labor force, housing, schools, police protection, fire protection, and medical services are available. A beneficial impact of increased tax revenue is expected. No adverse impacts would occur to minority or low-income communities.</p>	<p>No significant adverse socioeconomic impacts are anticipated. Adequate labor force, housing, and public services are available. The potential tax revenue would be lower than that anticipated for the proposed action because fewer workers would be required for construction and operation. No adverse impacts would occur to minority or low-income communities.</p>

**Table 2.3-1. Comparison of the potential impacts from the proposed Piñon Pine Power Project and the no-action alternative (continued).**

	Proposed Action	No-Action Alternative
Cultural Resources	The proposed location of the Piñon Pine Power Project's facilities would not disturb any historical or archaeological site. No impacts to Native American cultural resources are expected.	The facility would require less acreage, and would not disturb any historical or archaeological site. No impacts to Native American cultural resources are expected.
Health and Safety	Compliance with modified health and safety programs and engineering controls would minimize potential impacts that may pose a risk.	Health and safety procedures would be modified if necessary. No adverse impact is expected.
Hazardous and Toxic Materials/ Waste Management	Compliance with applicable Federal, state, and local requirements for handling, storing, transporting, and disposing solid and hazardous wastes would ensure minimal impacts. Options for disposal of LASH are being investigated. If LASH were to be disposed in the Lockwood landfill, it could reduce the 122-year lifespan of the landfill by 2 years.	There would be no LASH disposal, consequently no impact to the Lockwood landfill would result. Other impacts would be similar to those for the proposed action.
Noise	Except for steam blowing episodes, noise levels would be in compliance with the Storey County noise ordinance (84 dBA in the frequency range between 500 and 1,800 Hz). Measures would be taken to minimize the impact to local residents from the short-term impacts associated with "steam blowing". Storey County Building Department officials do not consider the infrequent exceedence of the noise ordinance to be a significant impact.	Except for steam blowing episodes, noise levels would be in compliance with the Storey County noise ordinance. Noise levels are expected to be lower than from the proposed action because noise attributed to coal handling and processing equipment (e.g., coal crusher — 86 dBA) would be eliminated. Measures would be taken to minimize the impact to local residents from the short-term impacts associated with "steam blowing".

**Table 2.3-1. Comparison of the potential impacts from the proposed Piñon Pine Power Project and the no-action alternative (continued).**

	Proposed Action	No-Action Alternative
Pollution Prevention	Existing programs, such as recycling, and replacing hazardous materials with non-hazardous materials would continue. The plant would remain a "zero discharge" facility. When practical, the zinc-based desulfurization sorbents would be returned to the manufacturer. Various uses of LASH are being evaluated so the solid waste could be reused.	Existing programs, such as recycling, and replacing hazardous materials with non-hazardous materials would continue. The plant would remain a "zero discharge" facility. Anticipated air emission levels and solid waste generation would be less than for the proposed action.

### 3. AFFECTED ENVIRONMENT

This chapter describes the environmental and socioeconomic resources in the vicinity of the proposed Piñon Pine Power Plant. The extent of the area described differs as a function of the resource being discussed and the extent of the potential impact. For example, in the socioeconomic discussion, resources across a three-county area are described, but, in the biological resources discussion, 545.5 acres were surveyed and thus constitute the affected area described.

#### 3.0 Summary of Changes Since the DEIS

*Existing air quality data have been updated in section 3.2.1 to reflect availability and use of a full year's worth of air quality on-site data. Section 3.4.3 has been changed to indicate that the new well, which will be constructed in 1994 and is not part of the proposed project, has been relocated to an area near the maintenance shops. The lowest recorded Truckee River flow is now based on actual data rather than the previously received approximations and has been changed from 55 cfs to 50.5 cfs. Archaeological sites are now identified using the Smithsonian trinomials in section 3.7.1. Other changes in this chapter include the addition of clarifying information in response to public comments.*

#### 3.1 Setting

The site selected for the proposed Piñon Pine Power Project is the existing Tracy Power Station located 27.4 kilometers (km) (17 miles) east of Reno, NV. The location of the Tracy Power Station within SPPCo.'s service territory, which includes more than 168,350 km<sup>2</sup> (65,000 square miles) in Nevada and California, is identified in Figure 3.1-1. Tracy Power Station is a 724-acre site located in Storey County, NV. Interstate 80 (I-80) is immediately adjacent and provides easy access to the site. Storey County, located in northwestern Nevada, is approximately 64 km (40 miles) from the California state line. Storey County is bordered on the west and the north by Washoe County, and on the east and the south by Lyon County. With 684 km<sup>2</sup> (264 square miles) of total land area, the county accounts for less than one-quarter of 1 percent of the state's total land area. The U.S. Bureau of the Census classifies Storey County as "rural" (*Storey County, 1993*).

The existing plant includes three steam electric generating units fired on either natural gas or number 6 fuel oil, and two combustion turbines fired on number 2 distillate fuel oil, which are used for

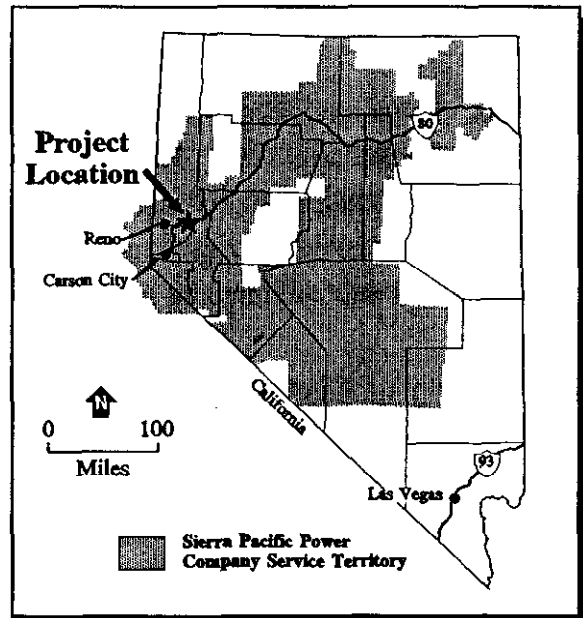
## Piñon Pine Power Project

system emergencies and unscheduled outages on other units. Other facilities include office facilities, two warehouses, a machine shop, a fuel oil storage area with five storage tanks, two propane storage tanks, two cooling towers, one cooling pond, one evaporation pond, and two paved parking lots. In addition, construction began in October 1993 on two 83.5 MW GE 7EA gas turbines, which can use either natural gas or distillate fuel; *the project was completed* in June 1994. Existing plant facilities in the immediate vicinity of the proposed project are shown in Figure 3.1-2.

The site is adjacent to the Truckee River. The surrounding area is arid high desert typical of the Great Basin Region. Elevation at the plant is approximately 1,305 meters (4,280 feet) above sea level. Two mountain ranges flank the canyon: the Pah Rah Range to the north, and the Virginia Range to the south. Clark Mountain, approximately 5.6 km (3.5 miles) to the south, is the largest feature in the area; elevation is 2,193 meters (7,195 feet) above sea level.







Vegetation near the proposed site includes desert shrubs and annual grasses in the Pah Rah Range, and salt desert shrub in the undeveloped areas of the Truckee Canyon (plant species include winterfat, fourwing saltbush, and Nevada dalea). Riparian vegetation along the Truckee River includes Fremont's cottonwood and an understory of Indian ricegrass, needle and threadgrass, and other perennial grasses and forbs. A few large trees and shrubs are present within the project area and provide some visual screening from I-80. More details on vegetation are provided in section 3.6.

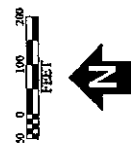
A rating system similar to that used by the U.S. Bureau of Land Management (BLM) was employed to evaluate visual quality. Four views were selected as key viewing areas (KVAs) (see Figure 3.1-3). The key factors of landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications were rated; additional factors, such as type of viewer, extent of use, and adjacent land uses, also were considered. The study area was deemed to have moderate to low scenic quality because the site is typical of the area and there is low to moderate natural visual variety. More details on the



**Figure 3.1-1. Tracy Power Station's location within SPPCo.'s service territory.**

**Legend**

-  Existing Structure
-  Existing Road
-  Fenceline
-  Railroad Spur
-  Septic System
-  Under Construction



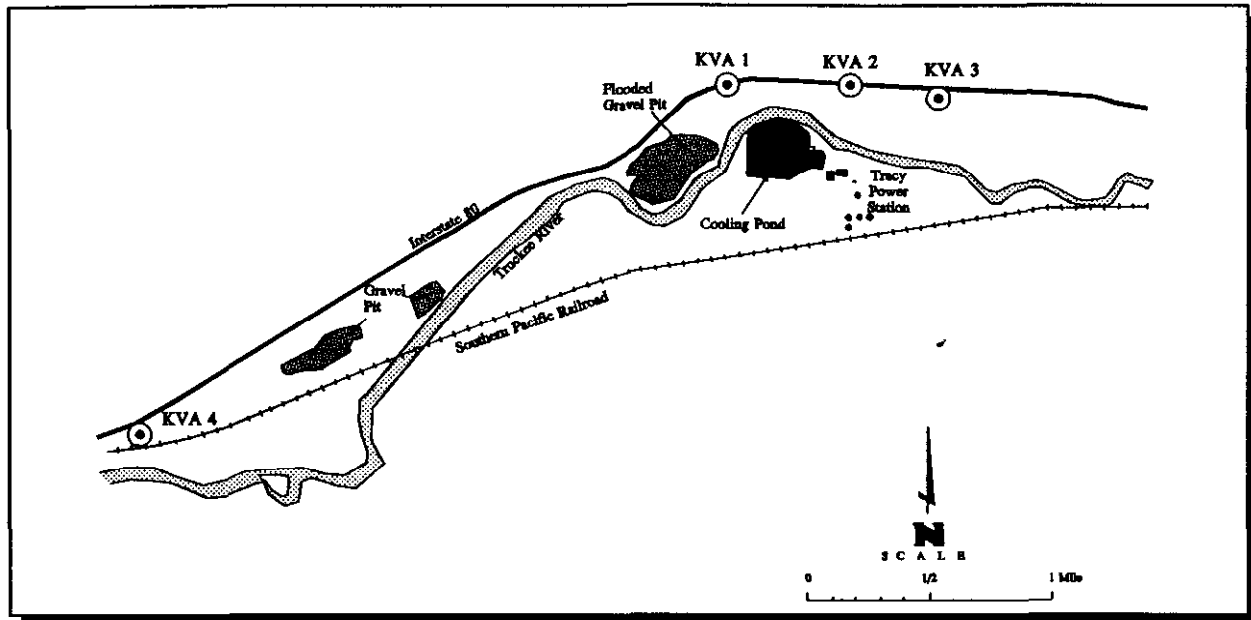


Figure 3.1-3. Location of key viewing areas (KVAs).

methodology used to reach this conclusion are provided in the Aesthetic Resources Technical Report, available in the reading rooms (see Appendix H).

At night, the main areas of the Tracy Power Station (stacks; generating units 1, 2, and 3; and warehouses) are lighted and clearly visible from I-80. The lighting is directed toward plant facilities and not toward surrounding areas. Within the project viewshed, potential viewers of the project include travellers along I-80, a four-lane divided highway; viewers at a scenic overlook on I-80 west of the site; local residents using local roadways; and travellers using Amtrak's California Zephyr on the Southern Pacific Railroad tracks south of the site.

Storey County does not have any specific policies or guidelines regarding aesthetic resources (*personal communication, John Palmer, Planner, Storey County Building Department, Virginia City, January 21, 1993, as cited in Ebasco, 1993a*). The Nevada Department of Transportation (NDOT) has designated a scenic overlook located off I-80 approximately 4.8 km (3 miles) southwest of the site. There currently are no plans to designate the section of I-80 along the Tracy Power Station as scenic highway (*personal communication, Keith Maki, Assistant Director, Nevada Department of Transportation, Reno, NV, March 10, 1992, as cited in Ebasco, 1993a*).

### 3.2 Atmospheric Conditions

The Virginia Range defines the eastern boundary of the Truckee Meadows Air Basin and the Sierras define the western boundary. Both the Virginia Range and Pah Rah Range border on the Truckee Canyon. Temperatures in the region range from  $-24^{\circ}\text{C}$  ( $-12^{\circ}\text{F}$ ) in winter to  $38^{\circ}\text{C}$  ( $100^{\circ}\text{F}$ ) in summer. Annual precipitation averages 19.05 cm (7.5 inches). The arid climate and elevation result in an average evaporation of 127 cm (50 inches) per year (mean Class A pan evaporation). A buildup of pollutants occurs during the winter months when thermal inversions trap pollutants from motor vehicles, wood stoves, and other ground level sources. The stable atmospheric conditions generally confine the highest pollutant concentrations to the Truckee Meadows Air Basin. The inversion generally dissipates by 10:00 or 11:00 a.m. from solar heating, leading to a general improvement in air quality. In spring, summer, and fall, large-scale down-slope winds from the Sierras (during evening hours) reinforce air drainage through the Truckee Canyon. The elevational decrease from Sparks to Tracy is approximately 61 meters (200 feet). Wind patterns in the region are typically from the northwest in winter and from the southwest in summer. Both wind and natural water drainage patterns flow from the Truckee Meadows in an easterly direction to the Truckee Canyon. Air quality modeling results indicate that emissions from the Tracy Power Station do not significantly impact the Truckee Meadows Air Basin.

The location of the meteorological and air quality monitoring site in relationship to the proposed and existing facilities is provided in Figure 3.2-1. In *November* of 1993, the SODAR site was installed. The term "SODAR" is an abbreviation for sound detection and ranging. It is an atmospheric remote sensing instrument that takes measurements, called "soundings," in vertical profile directly above the instrument's antenna system. The measurements are taken remotely by sending acoustic pulses upward and then measuring the acoustic energy reflected back to the instrument by the atmosphere. Measurements are made sequentially and repetitively along three beam paths, one of which is vertical and the other two slightly tilted off vertical and orthogonal to each other. The frequency difference, called Doppler shift, between the transmitted and reflected acoustic energy from each beam path is converted into a radial wind along that path. The three radial winds from the beam paths are mathematically combined to produce horizontal wind direction and speed at designated heights according to the length of time required for the increments of reflected acoustic energy to be received back at the antenna.

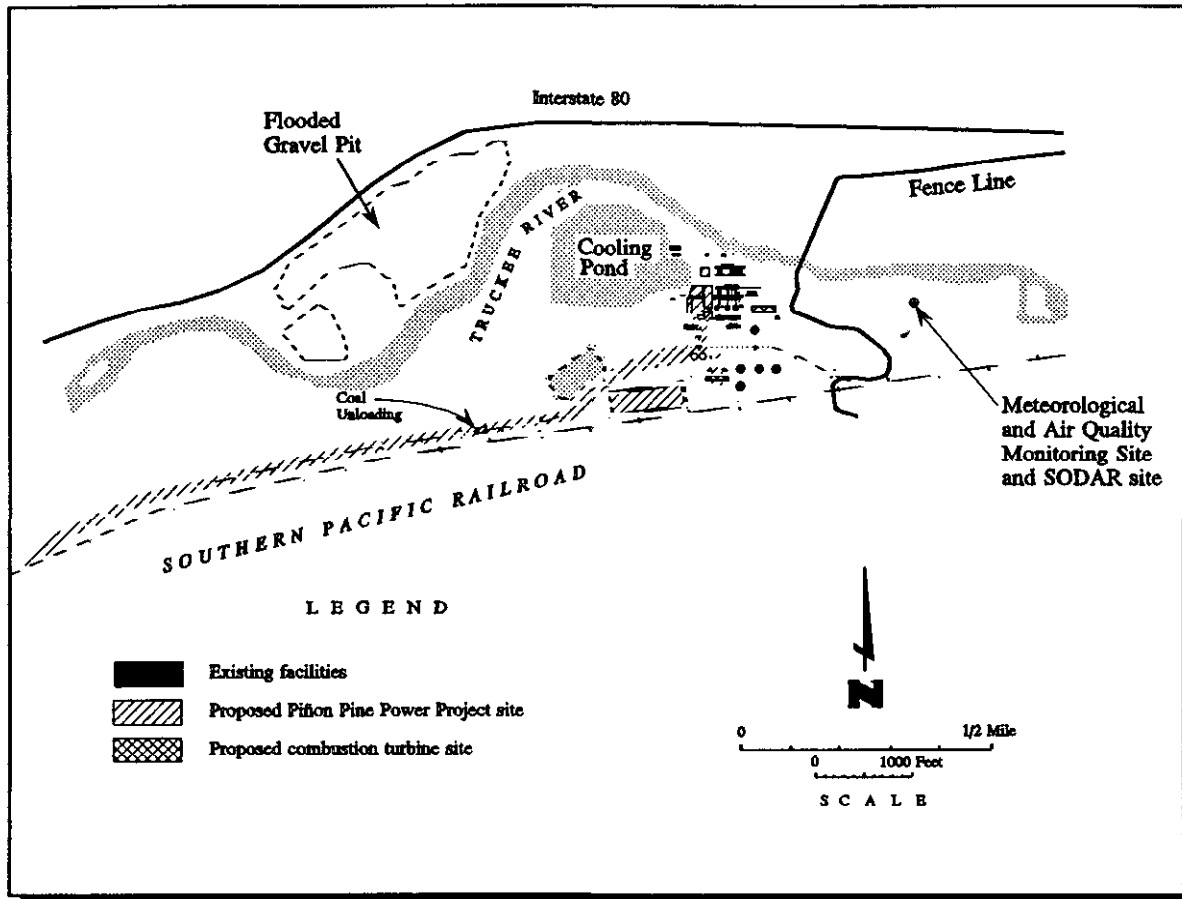


Figure 3.2-1. Location of the meteorological and air quality monitoring site.

### 3.2.1 Air Quality

Sections 109 and 301(a) of the Clean Air Act as amended in 1990 [42 U.S.C. 7409(a)], and Environmental Protection Agency (EPA) implementing regulations (40 CFR Part 50) define national primary and secondary ambient air quality standards as judged necessary to protect public health and welfare for the following "criteria" pollutants: sulfur dioxide ( $\text{SO}_2$ ), particulate matter ( $\text{PM}_{10}$  — particulates with aerodynamic diameters equal to or less than 10 microns), carbon monoxide (CO), ozone ( $\text{O}_3$ ), nitrogen dioxide ( $\text{NO}_2$ ), and lead (Pb). EPA regulations establish National Ambient Air Quality Standards (NAAQS), and the agency publishes a list of all geographic areas in relation to their compliance with NAAQS.

Areas where NAAQS are being achieved are designated as "attainment" areas and subject to Prevention of Significant Deterioration (PSD) regulations. The proposed project site is located in the Tracy Segment (Subbasin 83) of the Truckee River Basin (see Figure 3.2-2). The air quality in this area is designated as "unclassified". This designation indicates that historical air quality data is unavailable for the air basin. Unclassified areas are treated in the same manner as attainment areas (i.e., areas are assumed to be in compliance with NAAQS).

Areas not in compliance are designated as "nonattainment" areas. The Truckee Meadows Air Basin (Subbasin 87), which includes the Reno-Sparks metropolitan area, is a nonattainment area for CO and PM<sub>10</sub>. Currently, the nonattainment area is classified moderate for CO (9.1 - 16.4 ppm) and PM<sub>10</sub>. However, the Truckee Meadows will be reclassified as a serious PM<sub>10</sub> nonattainment area in the future because the 1991 State Implementation Plan (developed by states to achieve and maintain NAAQS) failed to demonstrate attainment by December 1994. Nonattainment areas for PM<sub>10</sub> were initially designated as moderate; however, areas that do not reach attainment within 4 years of enactment are designated as serious. In addition, an O<sub>3</sub> nonattainment area incorporating the Truckee Meadows Air Basin was identified by EPA. Because of the regional nature of O<sub>3</sub>, the boundary for the O<sub>3</sub> nonattainment area corresponds to the border of Washoe County which includes the CO/PM<sub>10</sub> nonattainment area. The O<sub>3</sub> nonattainment area is classified as marginal (*Washoe County District Health Department, 1993*).

Ambient monitoring of criteria pollutant concentrations near Tracy Power Station began in January 1993. ***Peak concentrations observed during calendar year 1993*** are shown in Table 3.2-1. The NAAQS are also provided for comparison. The data indicate that the existing air quality at the Tracy Power Station is in compliance with the NAAQS.

### 3.2.2 Visibility

During the winter, under certain meteorological conditions, fog is produced in the lower Truckee River Canyon, between Lockwood and Wadsworth. The frequency and duration of the fog events have not been recorded. During fog episodes, visibility may reach 0 percent and motorists may be required to reduce speeds to as low as 10 miles per hour. Present potential surface water sources of fog along I-80 from Patrick, NV, to Clark Station, NV, include the Truckee River, ***Granite*** Construction Gravel operation, the Tracy Power Station cooling and evaporation ponds, and an abandoned gravel pit northwest of the cooling pond for a total surface area of ***904,883*** square meters (***9,740,397*** square feet). On March 5, 1992, SPPCo. contacted the Nevada Department of Transportation (NDOT) regarding the issue and

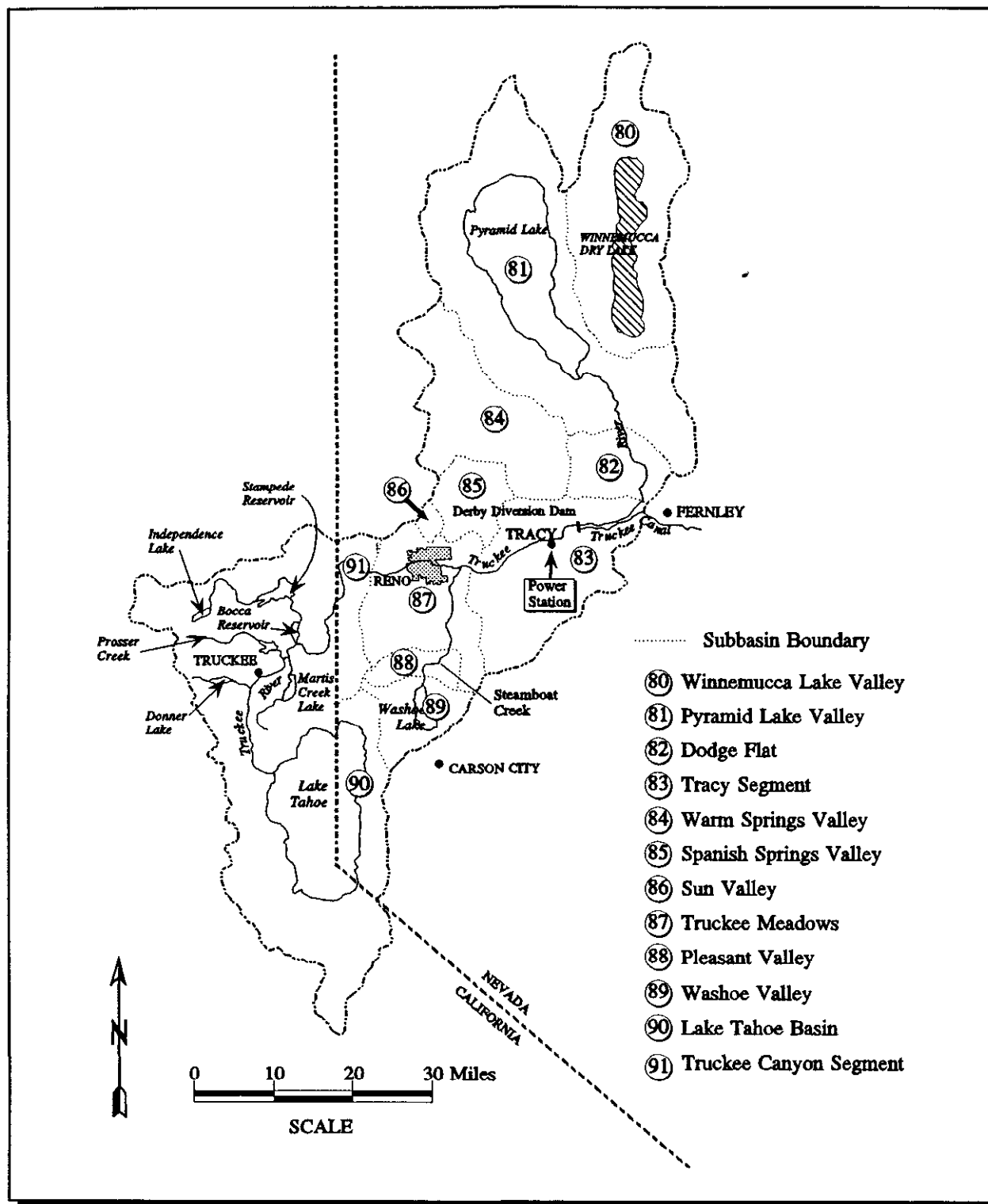


Figure 3.2-2. Air basins.

Table 3.2-1. Existing air quality, Tracy Station, NV.

Pollutant	Averaging Period	Peak Ambient Concentrations <sup>1</sup> ( $\mu\text{g}/\text{m}^3$ )	NAAQS ( $\mu\text{g}/\text{m}^3$ )
SO <sub>2</sub>	Annual	1.6	80
	24-hour	61	365
	3-hour	148	1300
NO <sub>2</sub>	Annual	16.6	100
CO	8-hour	1550	10,000
	1-hour	1938	40,000
Ozone	1-hour	142	235
PM <sub>10</sub>	Annual	16	50
	24-hour	63	150

<sup>1</sup> For the period January through *December 1993*.

potential traffic hazard. On October 6, 1992, the NDOT erected 1.2 meter by 1.2 meter (4 foot by 4 foot) yellow caution signs (see Figure 3.2-3) to warn motorists of occasional fog. Both westbound [0.8 km or 0.5 miles west of Exit 32 (Tracy-Clark)] and eastbound (3.0 km or 1.9 miles west of Exit 32) lanes of I-80 are marked with two signs each (one on the median and one on the road's shoulder). The signs are mounted on turn-around posts and can be operated by the Highway Patrol or NDOT personnel.



Figure 3.2-3. Highway fog warning sign.

### 3.3 Geology and Soils

The proposed site is in the Truckee River Canyon, 4.8 km (3 miles) south of the Pah Rah Range and 3.2 km (2 miles) north of the Virginia Range, and adjacent to the Truckee River. This section discusses the geologic features, stratigraphy, topography, and terrain encompassing and surrounding the proposed site.

Less than 2 million years ago, the Truckee River Canyon was occupied by a lake. As the lake receded, the Truckee River down-cut into the lake deposits and formed the present canyon. Where the river eroded lake sediments, it deposited fluvial channels and overbank deposits in their place. As a result, near-surface sediments at the site are composed primarily of these river deposits. The most recent deposits are relatively thin windblown deposits of silt and sand.

The project site is located in the western part of the Great Basin Tectonic Province and 40.2 km (25 miles) from the adjacent Sierra Nevada Tectonic Province. This transition zone is one of the most seismically active and complex regions of the United States (*Gates and Watters, 1992*). During the period from 1852 through 1992, 44 earthquakes of magnitudes greater than 5.0 on the Richter scale were reported. The magnitude of an earthquake at its epicenter is expressed using the Richter scale, a logarithmic scale ranging from 1 to 10; therefore, an earthquake with a magnitude of 6.0 is 10 times more forceful than an earthquake of magnitude 5.0 and is 100 times more than one of 4.0. The largest historical event close to the proposed project site measured 7.0 on the Richter scale in 1852; three earthquakes in December 1869 measured 5.5 to 6.7.

A variety of soil characteristics can affect land use. Permeability describes the ability of soil to transmit water or air. Runoff refers to precipitation discharged into stream channels from a drainage area. The term shrink-swell measures the tendency of soil particles to shrink (decrease) in size when dry and to swell (increase in size) when wet. Erosion potential measures a soil's ability to withstand wearing away by running water, wind, ice, or geologic activity.

Two soil types occur on the proposed project site: the 170—Saralegui-Isolde Association, which is slightly acidic with a pH of 6.5 and the 602—Pits-Dumps Complex, which is mildly alkaline with a pH of 7.6. The Saralegui soil, derived from alluvium, has moderately rapid permeability (5 to 15 cm or 2 to 6 inches per hour), slow runoff, low shrink-swell potential, and moderate wind erosion potential. The Isolde soil, derived from windblown material, has rapid permeability (15 to 50 cm or 6 to 20 inches per hour), very slow runoff, low shrink-swell potential, and moderate wind erosion potential.

### **3.3.1 Geology and Seismic Activity**

Geology is the scientific study of the origin, history, structure, and processes of the earth. Geological time has been divided into chronological units; the last 570 to 600 million years are divided into the units of era, period, epoch, and age. The Cenozoic Era covers the current period that began

66 million years ago. It is comprised of two periods. The Quaternary Period includes the Holocene Epoch (15,000 years ago to the present) and the Pleistocene Epoch (15,000 to 2 million years ago). The Tertiary Period includes the Pliocene Epoch (2 to 5 million years ago), the Miocene Epoch (5 to 24 million years ago), the Oligocene Epoch (24 to 37 million years ago), the Eocene Epoch (37 to 58 million years ago), and the Paleocene Epoch (58 to 66 million years ago). The Mesozoic Era covers the period from 250 million years ago to the Cenozoic Era. Rocks of the Tertiary and Quaternary Periods constitute nearly all of the surface area in the region of the Tracy Power Station (i.e., volcanic and sedimentary rocks and unconsolidated lake and alluvial deposits). Minor occurrences of pre-Tertiary rocks, mostly intrusive of the Mesozoic Era, also are found in the vicinity of the site.

The proposed site is located in the Truckee River Canyon. Late during the Pleistocene Epoch, the Truckee River Canyon was occupied by Lake Lahontan, which covered an area extending approximately 40.2 km (25 miles) south from Pyramid Lake. As the lake receded, the Truckee River began to down-cut into the lake deposits and subsequently formed the present canyon. Where the river eroded away the lake sediments, it deposited fluvial channel (beds of river materials) and overbank deposits in their place. As a result, near-surface sediments at the site are composed primarily of river deposits consisting of minor clays, silts, sands, gravelly sands, sandy gravels, and coarse gravels. Lake deposits of clay, silt, sand, gravel, and calcareous tufa (porous stone containing calcium) may occur beneath the site. The most recent deposits are relatively thin eolian (windblown) deposits of silt and fine sand that mantle (cover) portions of the surface.

The hills south of the site consist largely of olivine basalt (rock of volcanic origin containing a mineral silicate of magnesium and iron) and hornblende andesite (mineral consisting of silicate of calcium, magnesium, and iron in fine-grained volcanic rock) flows of the Pleistocene Kate Peak Formation, which provided much of the material that presently fills the canyon. The site itself is relatively level to very gently rolling terrain with moderate relief. The site elevation is highest toward the south and gently slopes to the north toward the Truckee River. Relief in the surrounding area varies from very low in some of the intermountain basins to quite high in the adjacent mountain ranges. The average elevation at the site is approximately 1,295 meters (4,250 feet). Typical elevations of the nearby basins are between 1,219 and 1,829 meters (4,000 and 6,000 feet); elevations at the tops of bordering mountain blocks range between 1,829 and 2,438 meters (6,000 and 8,000 feet). The major structural elements in the general region surrounding the site are the Pah Rah Range to the north; the Virginia Range to the south; the Walker Lane Fault Zone to the northeast; and the Olinghouse Fault Zone, which trends east-west along the southern flanks of the Pah Rah Range (see Figure 3.3-1).

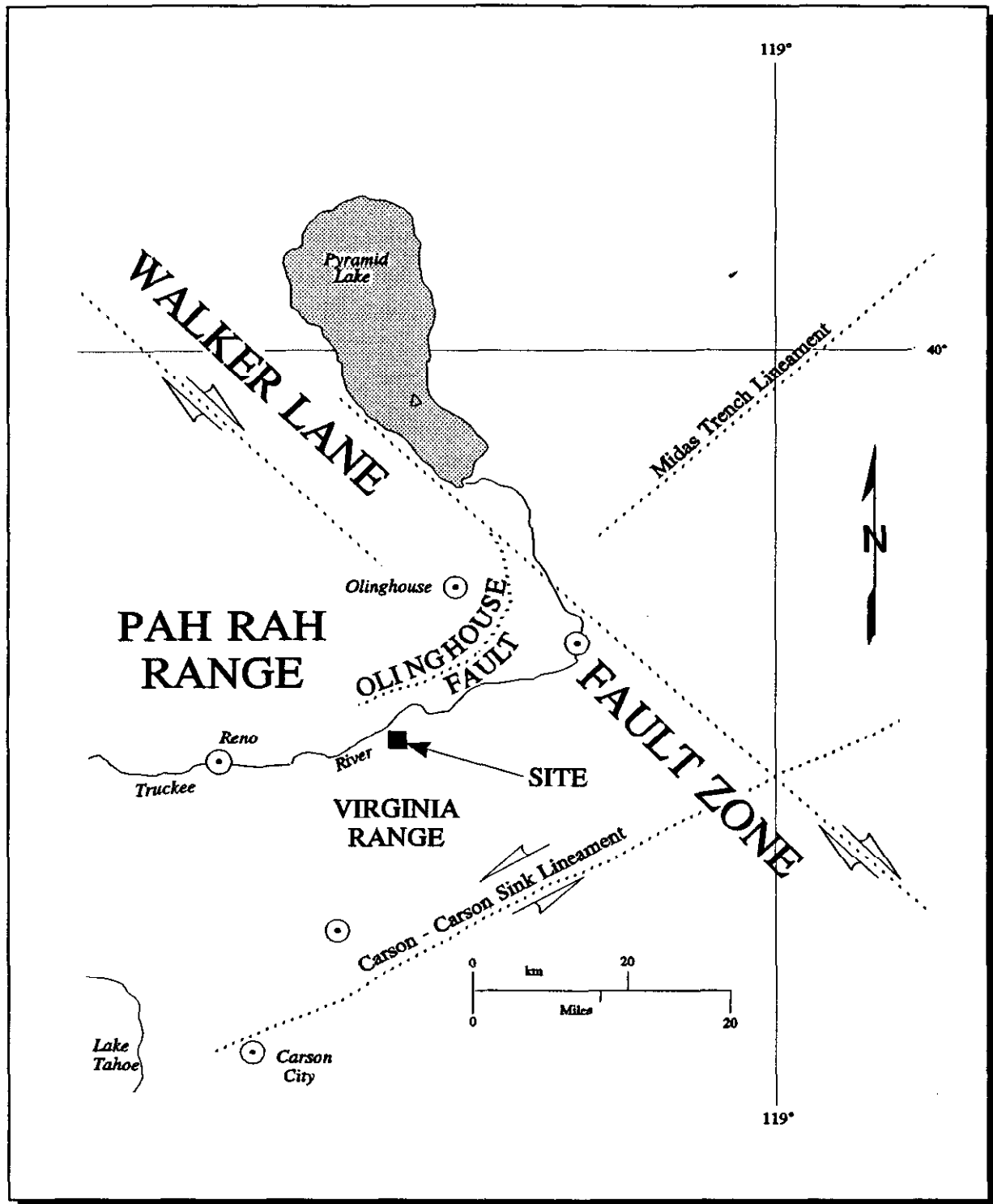


Figure 3.3-1. General geologic structure surrounding proposed site.

The Tracy Power Station project site is located in the western part of the Great Basin Tectonic Province. The site is located about 40.2 km (25 miles) from the adjacent Sierra Nevada Tectonic Province. This location, in a transition zone between two tectonic provinces, is one of the most seismically active (Seismic Zone 4) and complex regions of the United States (*Gates and Watters, 1992*). The geologic provinces and fault zones in the area are identified in Figure 3.3-2.

Based on seismicity and style of faulting, the western Great Basin has been divided into three subprovinces (*Slemmons, 1980*): (1) the transition between the Sierra Nevada Frontal Fault Zone and the Walker Lane Fault Zone; (2) the Walker Lane Fault Zone; and (3) the Great Basin Zone east of the Walker Lane Fault Zone. The Walker Lane Fault Zone is a 32.2-km- (20-mile-) wide, northwest-trending zone of mainly right-lateral faults that extend from near Walker Lake northwest through Pyramid Lake and into the Modoc Plateau of California. North of Pyramid Lake, the faults tend to radiate more northward and the Walker Lane Fault Zone becomes wider and more diffuse overall. The Walker Lane faults south of Pyramid Lake are relatively quiet, compared to the faults in the other subprovinces, although active faults are abundant in northeast California. *The closest active fault to the site within the Walker Lane is the Pyramid Lake strand, which is approximately 22 km (15 miles) from the site. It has an estimated Maximum Credible Earthquake value of 7.5 (Slemmons, 1980). (A Maximum Credible Earthquake, MCE, is the most serious earthquake that can be hypothesized from known geologic characteristics.)*

East of the Walker Lane Fault Zone, faults are generally north-south trending normal faults. This part of the Great Basin has had several historic earthquakes of magnitude 6.6 to 7.7, including the 1954 Rainbow Mountain, Fairview Peak, and Dixie Valley earthquakes. Epicenters along the Dixie Valley-Fairview Peak area continue south across the Walker Lane Fault Zone and intersect the Sierra Nevada Frontal Fault Zone. Forty-four earthquakes of magnitude greater than 5.0 have been reported in the area between 1852 and 1992.

The Truckee-Verdi-Reno-Olinghouse Transverse Fault Zone is of particular concern because it passes near the proposed site and includes the Olinghouse Fault Zone (see Figure 3.3-2). The active portion of the Olinghouse Fault Zone extends from 16 km (10 miles) east of Reno along the north side of the Truckee River Canyon, passes through Olinghouse Canyon, and abruptly arcs to the northeast to terminate against a fault of the Walker Lane Fault Zone for a total length of 23 km (14 miles) (*Sanders and Slemmons, 1979*). In 1869, a series of earthquakes with magnitudes up to 6.7 occurred along this fault (*Slemmons, 1980*), producing surface rupture north, west, and east of Tracy. This fault is located

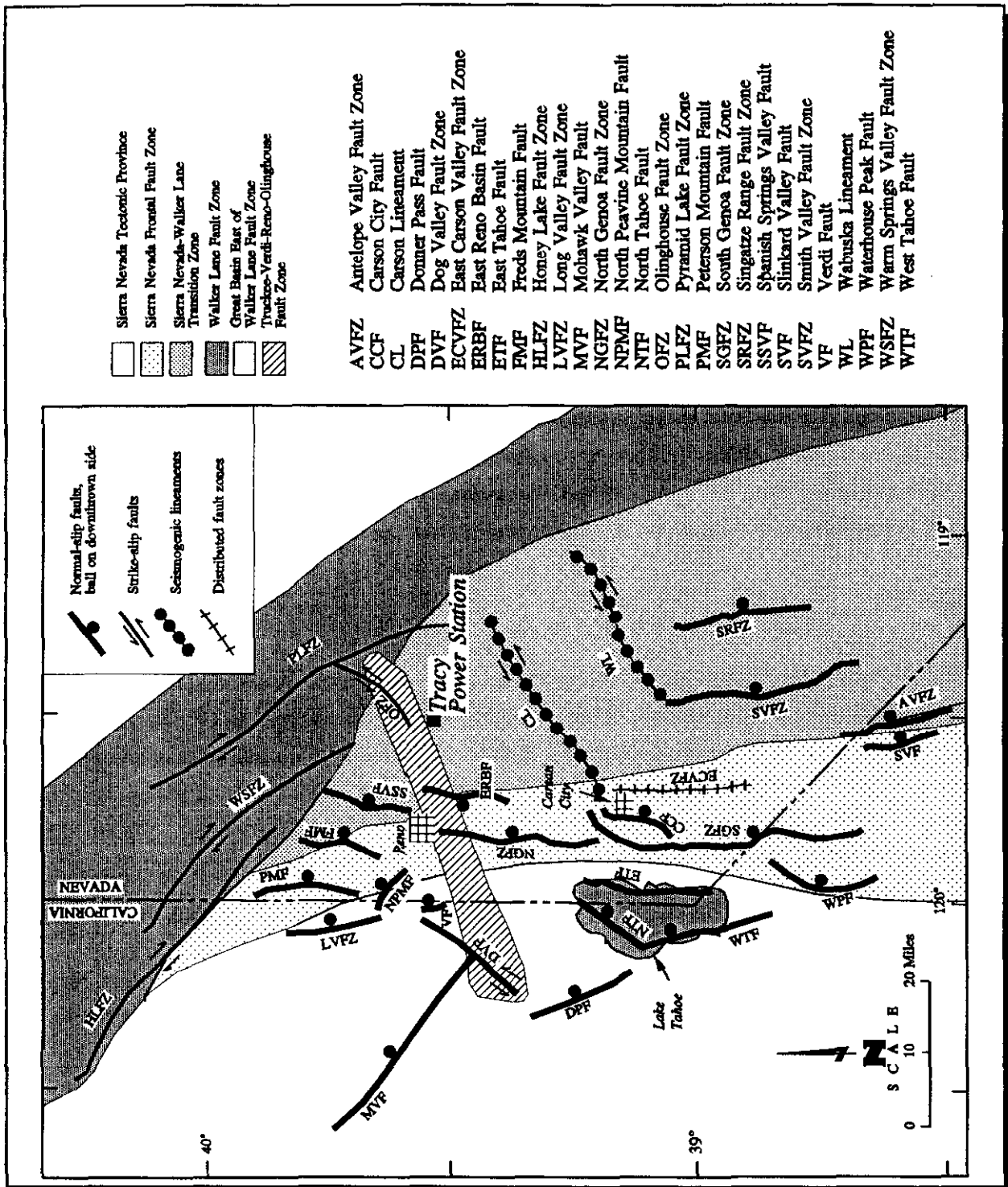


Figure 3.3-2. Geologic provinces and fault zones (dePolo, 1993; Jennings, 1992; and Slemmons, 1980).

approximately 1.6 km (1 mile) from the proposed site at its closest approach; it has an estimated Maximum Credible Earthquake value of 7.1 (*Slemmons, 1980 as cited in Ebasco, 1993b*).

The largest historical seismic events close to the project site are the 1852 event with a possible magnitude of 7.0 and the three December 1869 earthquakes with estimated magnitudes of between 5.5 and 6.7. The 1852 earthquake was located just south of Tracy Station; however, the precise location of the earthquake has not been determined because information is based solely on descriptions by members of the Paiute Indian Tribe who were camping south of Pyramid Lake near Wadsworth (*Slemmons et al., 1964; personal communication, D. dePolo, Seismologist, University of Nevada—Reno Seismology Laboratory, Sacramento, CA, March 1993*). The epicenters of the 1869 earthquakes were located on the Olinghouse Fault Zone 16 to 39 km (10 to 24 miles) east of Reno. This zone is where the surface rupture occurred and includes the closest approach of the fault to the site (*Sanders and Slemmons, 1979, as cited in Ebasco, 1993b*). Some of the more significant earthquakes that occurred near the proposed site are summarized in Table 3.3-1. Additional information is provided in the Geology, Soils, and Seismicity Technical Report, available in the reading rooms (see Appendix H).

### **3.3.2 Soils**

The two types of soils that occur on the project site, determined by the Soil Conservation Service, are 170—Saralegui-Isolde Association and 602—Pits-Dumps Complex (see Figure 3.3-3). The Saralegui-Isolde Association occurs on lake-plain terrace and alluvial fans. The Association consists of 45 percent Saralegui sand, zero to 4 percent slopes; 40 percent Isolde fine sand, 4 to 15 percent slopes; and 15 percent inclusions of Ackley gravelly sandy loam (10 percent) and badlands (5 percent). (Slope is a measurement of the inclination of the land surface from the horizontal; for example, a slope of 10 percent is a drop of 3 meters (10 feet) in 30 meters (100 feet) of horizontal distance).

The Saralegui soil (pH 6.5) is derived from alluvium (material such as sand, silt, or clay, deposited on land by streams), has moderately rapid (5 to 15 cm or 2 to 6 inches per hour) permeability, slow runoff, low shrink-swell potential, and moderate wind erosion potential. Its corrosivity is high to steel and low to concrete; its potential to frost action is moderate.

The Isolde soil is derived from eolian materials and is found on dunes on alluvial fans, exhibiting rapid (15 to 50 cm or 6 to 20 inches per hour) permeability, very slow runoff, low shrink-swell potential, and moderate wind erosion potential. The depth to the seasonal high water table is greater than 1.5

**Table 3.3-1. Historic surface faulting in the western Great Basin and approximate distances from the epicenters to Tracy Power Station (modified from Slemmons, 1980).**

Earthquake Date	Earthquake Magnitude (Richter scale)	Rupture Length (km)	Maximum Displacement (m)	Faults, State	Distance from Tracy to epicenter (km) <sup>1</sup>
Dec 27, 1869	6.7	25.5	3.65	Olinghouse, Nevada	14.5 <sup>2</sup>
Mar 26, 1872	8.0	111	6.44	Mid-Valley and others, Owens Valley, California	724.5 <sup>3</sup>
1875	6.8	?	?	Wash, Mohawk Valley, California	~64.4
1903	-	4.8+	1	Gold King, Nevada	> 161
Oct 2, 1915	7.75	62.8	5.6	Several, Pleasant Valley, Nevada	193 <sup>2</sup>
Oct 20, 1932	7.3	62.8	1.3	Several, Cedar Mountains, Nevada	~161 <sup>2</sup>
Jan 30, 1934	6.3	1.6-	0.12	Excelsior Mountain, Nevada	85.3
Dec 14, 1950	5.6	9	0.61	Fort Sage Mountain, California	74.1
Jul 6, 1954	6.6	17.7	0.31-	Rainbow Mountain, Nevada	87
Aug 23, 1954	6.8	30.6	0.76	Rainbow Mountain, Nevada	87
Dec 16, 1954	7.1	58	5.62	Several, including Fairview Peak, Nevada	129 <sup>4</sup>
Dec 16, 1954	6.9	61.2	3.25	Several, including Dixie Valley, Nevada	129 <sup>4</sup>
Sept 12, 1966	6	17.7?	0.1?	Dog Valley (Stampede), California	53.1

<sup>1</sup> Derived from data supplied by University of Nevada Seismological Laboratory.

<sup>2</sup> Derived from Sanders and Slemmons (1979).

<sup>3</sup> Gates and Watters (1992).

<sup>4</sup> Slemmons (1980).

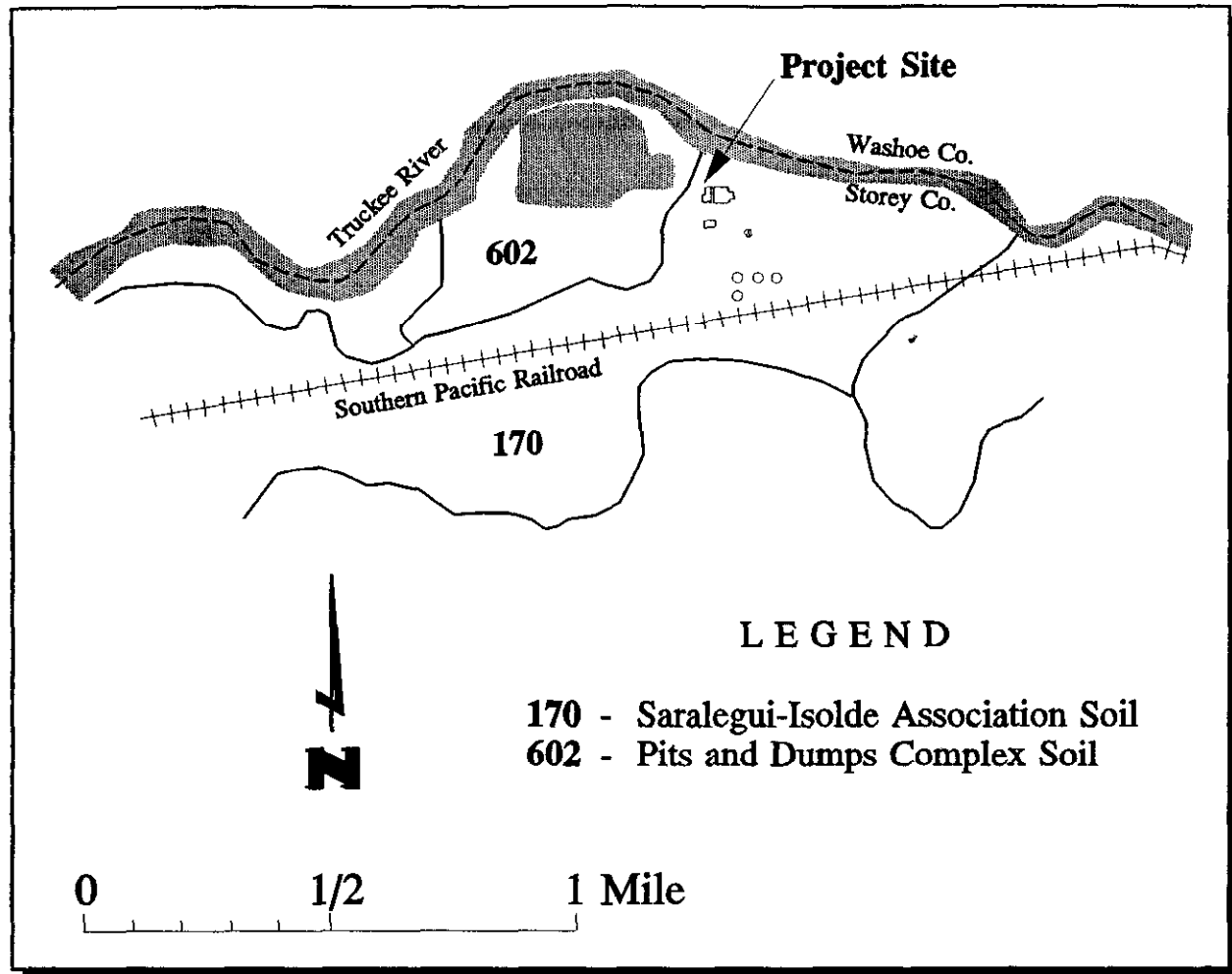


Figure 3.3-3. Soils at the proposed Piñon Pine Power Project site.

meters (60 inches). The Isolde soil has high corrosivity to steel and low corrosivity to concrete; its potential to frost action is low.

The Pitts-Dumps Complex (pH 7.6) consists of broken rock and excavated alluvial deposits. This soil complex at the proposed site is in an altered and disturbed condition.

Additional information is provided in the Geology, Soils, and Seismicity Technical Report, available in the reading rooms (see Appendix H).

### 3.4 Water Resources

The main water supply to the proposed plant is the Truckee River, which is regulated by the Federal Water Master at the outlet of Lake Tahoe. The Truckee River Basin comprises 7,925 km<sup>2</sup> (3,060 square miles) and is located in eastern California and western Nevada. It drains approximately 2,771 km<sup>2</sup> (1,070 square miles) of mountainous terrain including 1,295 km<sup>2</sup> (500 square miles) above the Lake Tahoe Outlet, and has its headwaters in California's Sierra Nevada mountains from which it flows into the southern end of Lake Tahoe. Tahoe, a natural lake, is the first location where the Truckee River waters can be controlled by a small dam, which is located at Tahoe City. From the lake, the river flows approximately 24 km (15 miles) in a northerly direction to the town of Truckee, CA, then northeasterly about 64 km (40 miles) to the City of Reno, NV (see Figure 3.4-1). Below Reno, the river flows 80 km (50 miles) in an easterly and northerly direction to its terminus in Pyramid Lake, a remnant of prehistoric Lake Lahontan. Pyramid Lake historically overflowed into adjacent Winnemucca Lake, but Winnemucca Lake has not received appreciable inflow since about 1910, and eventually it dried up in 1940 (*California Department of Water Resources, 1991 and State of Nevada, 1980*).

The Truckee River has no outlet to the sea. Its main tributaries below Lake Tahoe are the Little Truckee River, and Prosser, Donner, Martis, and Steamboat Creeks. Near Reno, the river enters a vast valley, the western and northern sections of which are occupied by the cities of Reno and Sparks. The eastern portion of the valley, known as Truckee Meadows, is low in elevation and poorly drained. During large runoff periods, this area is flooded extensively (*ACOE, 1985*).

The Truckee River is fed predominantly by snowpack runoff from Lake Tahoe and tributary drainages. Precipitation at the site is very low, approximately 19.05 cm (7.5 inches) per year. Evaporation is high, reportedly 127 cm (50 inches) from exposed water surfaces (*ACOE, 1985*). Throughout much of its length in Nevada, river flow has a net loss by way of evaporation and infiltration. Precipitation and runoff vary widely from year to year. The river's greatest historical annual flow at the California/Nevada border was in excess of 1.7 million acre-feet in 1983 (2,380 cfs); the lowest was just over 133,000 acre-feet in 1931 (186 cfs). *At the Tracy Station gauge, the greatest averaged annual flow measured was 1,950,000 acre-feet per year in 1983; the lowest averaged flow measured was 109,800 acre-feet per year in 1992.* These wide fluctuations in flow, coupled with a lack of reservoir storage capacity in areas upstream of major users, keep the basin's water supply systems from meeting peak water demands during an extended drought. In most years, inflows to Pyramid Lake are less than the

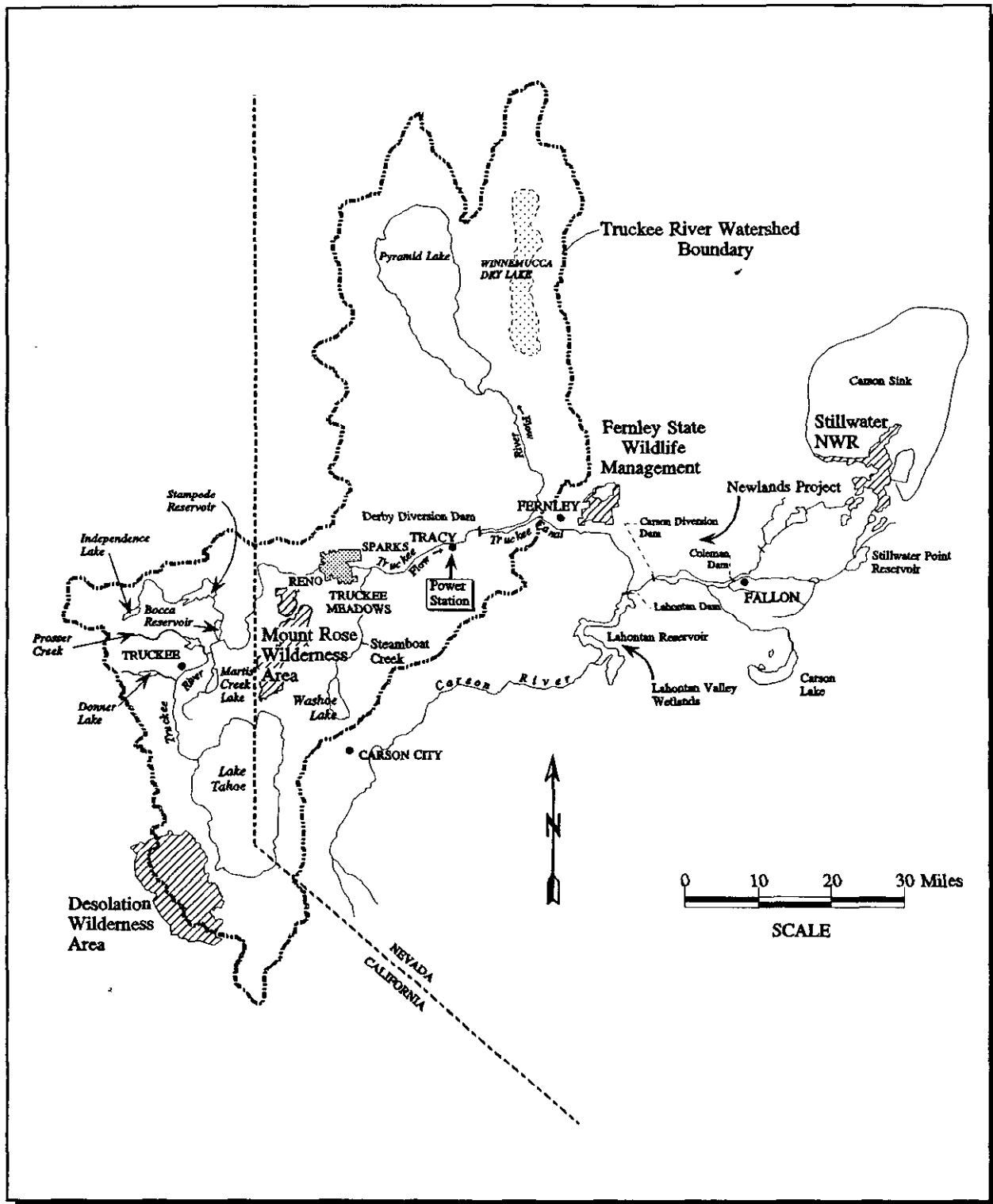


Figure 3.4-1. The Truckee River basin and surroundings.

430,000 acre-feet of annual flow (602 cfs) necessary to sustain the lake's level during average climate conditions. Although currently depleted, actions (e.g., the Truckee-Carson-Pyramid Lake Water Rights Settlement Act and the curtailment of water to the Newlands Project) are being undertaken to address the continued long-term viability of Pyramid Lake and the Cui-ui, an endangered fish species. *One objective* of the Cui-ui Recovery Plan is to provide attraction flows which will cause the Cui-ui to enter the Truckee River to spawn. The Cui-ui would be considered for de-listing as an endangered species when it is demonstrated that the species has a 95 percent probability of persisting for 200 years. While difficult to measure accurately, mean annual flows into Pyramid Lake are estimated to be approximately 420,000 acre-feet per year. Based on current knowledge and conditions, this corresponds to an equivalent benefit of increasing annual Truckee River inflows to Pyramid Lake by 100,000 acre-feet acquired at a minimum rate of 5,000 acre-feet per year.

#### **3.4.1 Water Use and Availability**

Like many western states, Nevada's water law (Nevada Revised Statutes (NRS) of 1957, as amended, Chapters 533 through 544) is based on the appropriative doctrine for both groundwater and surface water. The doctrine of appropriative rights was commonly used throughout the arid west as early settlers and miners began to develop the land. The appropriative doctrine is based on the concept of first in time, first in right. The water rights of the first person to take a quantity of water and put it to beneficial use are of a higher priority than a subsequent user. An application for a permit to appropriate water must be filed with the State Engineer at the Nevada Division of Water Resources (*State of Nevada, 1974*).

Current Truckee River surface water rights were adjudicated in the Final Decree entered September 8, 1944, in United States of America v. Orr Ditch Water Company, et al., (D. Nev. 1994, "Orr Ditch Decree"). Orr Ditch Decree water rights, having priority dates from 1865 to 1897, were initially adjudicated for irrigational uses. Over time and in accordance with the Orr Ditch Decree and Nevada water law, modifications were made by which the rights were permitted for municipal and industrial purposes. However, all conditions and limitations of the irrigation rights remain. *The Pyramid Lake Paiute Tribe holds the first two claims to water under the Orr Ditch Decree.*

There has been continuing conflict (including legal action) involving several Federal agencies, the states of Nevada and California, SPPCo., the Pyramid Lake Paiute Tribe, and other entities, concerning both water rights and operating criteria for several reservoirs in the watershed. In addition

## **Piñon Pine Power Project**

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to the conflicts between municipal and industrial uses and irrigated agriculture (both by non-Indian and Indian users), aboriginal Indian fisheries, wetland maintenance, and migratory waterfowl production are competing for approximately 750,000 acre-feet per year (1,050 cfs) of decreed rights (NRC, 1992). In 1990, the U.S. Congress enacted Pub. L. 101-618, the Truckee-Carson-Pyramid Lake Water Rights Settlement Act ("Settlement Act"), which authorizes an Operating Agreement on the Truckee River among California, Nevada, and the United States. *One of the requirements is that the river system must be operated in a manner that satisfies Orr Ditch Decree water rights. (There are four additional requirements: All applicable dam safety and flood control requirements must be met; spawning flows must be enhanced; terms of the Preliminary Settlement Agreement between SPPCo. and the Pyramid Lake Paiute Tribe must be met; and costs associated with the Stampede Reservoir must be minimized.)* An Environmental Impact Statement addressing the Operating Agreement is now under preparation by the Bureau of Reclamation.

Four major water users depend on the Truckee River and Carson River basins' limited supplies: the Newlands Project; the Truckee Meadows area; the Lahontan Valley wetlands; and the Pyramid Lake endangered fish species (see Figure 3.4-1) (NRC, 1992).

The Newlands Project, in the Carson Basin, currently is considered the Truckee River's largest water user, *although its water rights are more junior to those of the Pyramid Lake Paiute Tribe and SPPCo.* The Newlands Project, named after Nevada's U.S. Senator Francis G. Newlands, was the first project under the Reclamation Act of 1902. Senator Newlands regarded agricultural development as the key to Nevada's future and began advocating irrigation projects as early as the 1880s. The Newlands Project was implemented for the purpose of irrigating large areas of land in the Lahontan Valley that received little rainfall. Derby Dam was built in 1906 on the Truckee River to divert flow to the Truckee Canal, which terminates in the Lahontan Reservoir located on the Carson River. This allowed irrigation of lands that could not otherwise be irrigated by the low flow of the Carson River. The Newlands Project also supplies water to approximately 6,000 acres in the Truckee River watershed near Fernley. The Newlands Project irrigation continues to be the single largest use of water from the Truckee River (California Department of Water Resources, 1991). In recent years, water to the Newlands Project has been substantially curtailed, from an annual total of 240,000 acre-feet per year (336 cfs) in the mid-1960s to the current consumption of 100,000 acre-feet per year (140 cfs) (Batt, 1993).

The Truckee Meadows area also is a large user of water for agricultural purposes. The Orr Ditch Decree allowed irrigation of approximately 32,000 acres from the state line through the Truckee

Meadows. The Truckee Storage Project was designed to provide supplemental irrigation water to about 29,000 acres of the Truckee Meadows; however, because of the current degree of urbanization, only 10,000 acres currently are irrigated. Water from the Bocca Reservoir on the Little Truckee River and unstored water diverted from the river serve as sources of irrigation water (*California Department of Natural Resources, 1991*). Total irrigation water use from the western outskirts of the Truckee Meadows downstream to Pyramid Lake (excluding Truckee Canal diversions) in the past few years has ranged from 64,000 to 77,000 acre-feet per year (89.6 to 108 cfs). Irrigation is primarily used for alfalfa and grain crops, and irrigated pasture (*California Department of Water Resources, 1991*).

Wetland ecosystem protection is a major water use. The Carson River drains into the Lahontan Valley marshes and Carson sink. Prior to human settlement, approximately 85,000 acres of wetlands were sustained by the Carson River, and the Lahontan and Pyramid ecosystems. The development of the Newlands Project created a conflict with the two ecosystems that continues to the present. The construction of Derby Dam in 1906 diverted more than one-half of the Truckee River flow into the Carson River via the Truckee Canal and Lahontan Reservoir, reducing the mean annual flows to Pyramid Lake to less than 300,000 acre-feet per year. Among the adverse impacts of the Newlands Project to wetland ecosystems was the drying up of Winnemucca Lake and the lowering of the water level in Pyramid Lake by nearly 24 meters (80 feet), resulting in the near extinction of an Indian fishery (*NRC, 1992*). On average, 600,000 acre-feet per year (840 cfs) flowed into the Pyramid Lake each year before the Truckee River was diverted and consumed for irrigation. Annual average inflows were approximately one-half of historic flows until recent litigation and curtailment of water use for irrigation somewhat ameliorated the situation (*NRC, 1992*). Current annual inflows to Pyramid Lake average 420,000 acre-feet per year (*it is estimated that 430,000 acre-feet per year are required to maintain the lake's level; when the inflow is not exceeded by the evaporation rate, the lake is considered stable*).

Additional flows are required for spawning of the federally-listed endangered Cui-ui (a large omnivorous sucker fish found only in Pyramid Lake and a historic food source for the Pyramid Lake Paiute Indian Tribe), and the federally-listed threatened Lahontan cutthroat trout (*NRC, 1992*). To have the Cui-ui removed from the endangered species list, the Cui-ui Recovery Plan calls for Pyramid Lake to receive additional water inflow of 100,000 acre-feet, or an equivalent benefit at a minimum rate of 5,000 acre-feet per year (7.0 cfs) (*USFWS, 1992*). *One objective* of the Cui-ui Recovery Plan is to provide attraction flows that will cause the Cui-ui to enter the Truckee River to spawn. Further information on the Cui-ui and the Lahontan cutthroat trout is provided in section 3.6.3.

In addition to supplying electricity, SPPCo. serves as a retail and wholesale supplier of municipal water to the greater Reno/Sparks area. In this capacity, SPPCo. holds one of the most senior direct diversion rights on the river — a right to divert 28,959 acre-feet or 40 cfs from the Truckee River throughout the year. This right is subject to the Pyramid Lake Paiute Indian Tribe's 1859 rights for its Reservation. The seniority of this right means water is physically available to SPPCo. for diversion in all but the driest years. Over time, SPPCo. also has acquired former Truckee Meadows irrigation water rights having a face value of approximately 41,000 acre-feet per year (57.4 cfs). In the past few years, Truckee River municipal diversions by SPPCo. below the state line have ranged from 43,000 to 49,000 acre-feet per year (60.2 to 68.6 cfs). SPPCo. also supplies a portion of its demand for municipal water from groundwater; it holds rights to approximately 48,000 acre-feet per year (67.2 cfs) of Truckee Meadows groundwater, although the Nevada State Engineer has restricted extractions to around 15,000 acre-feet per year (21 cfs) (*California Department of Water Resources, 1991*).

Under the Orr Ditch Decree, the Tracy Power Station has approximately 3,500 acre-feet per year (4.9 cfs) in surface water rights. *In addition, two underground water rights, obtained in 1961 and 1974 in accordance with Nevada water law, NRS 533 (State of Nevada Certificate of Appropriation of Water #6231 and #9207), are available for use at the Tracy Power Station and have a combined annual total of approximately 600 acre-feet per year (0.84 cfs). Tracy Power Station surface water rights are for industrial and domestic uses (dePaoli, 1992) and are listed in Table 3.4-a.*

### 3.4.2 Surface Water

Surface water areas associated with the proposed site include the Truckee River, the existing 271,999-cubic meter (355,740 yd<sup>3</sup>) cooling pond, and the present 22,203-cubic meter (29,040 yd<sup>3</sup>) evaporation pond. Tracy Power Station is maintained as a "zero discharge" plant in that no wastewater from the plant is discharged into the Truckee River. Blowdown from the circulating water system is discharged into the unlined cooling pond, and the boiler water system blowdown is discharged into the evaporation pond which was lined with an impervious synthetic liner in 1972. Maintenance of the evaporation pond liner or removal of solids from the pond occurs as needed. The evaporation pond and the cooling pond were constructed prior to adoption of any local, state, or Federal water quality regulations. The sources of water discharged to existing Tracy ponds are provided in Table 3.4-1.

All stormwater, if any, draining from the property discharges to the cooling pond. The dominant local drainage direction is northward toward the Truckee River. Drainage from the hill slopes, south of

Table 3.4-a. Tracy Station surface water rights.

Application Number	Certificate Number	Source	Priority Date	Acquisition Date	Certificate Date	Use	Annual (acre-ft)	Remarks
19881	6572	River	4/1/1874	9/16/1960	3/11/1968	Industrial	338.0	Orr Ditch Claim #629
19883	6229	River	1/18/1890	1/18/1967	3/22/1967	Industrial	138.0	Orr Ditch Claim #643
19884	6230	River	5/31/1869	1/18/1961	3/22/1967	Industrial	699.3	Orr Ditch Claim #641
28192	8768	River	6/26/1897	3/24/1961	5/21/1976	Industrial	948.0	Orr Ditch Claim #14
29213	9199	River	5/1/1880	8/27/1975	2/17/1978	Industrial	301.0	Orr Ditch Claim #639
29214	9200	River	5/1/1880	8/27/1975	2/17/1978	Industrial	186.0	Orr Ditch Claim #640
29215	9201	River	10/1/1865	8/27/1975	2/17/1978	Industrial	576.0	Orr Ditch Claim #642
29216	9202	River	1/1/1866	8/27/1975	2/17/1978	Industrial	322.0	Orr Ditch Claim #645

the power plant, is intercepted by the railroad track grade and diverted to culverts beyond the plant site. Drainage on the developed portion of the property (approximately 80 acres) is principally in the form of sheet flow caused by both the high percentage of impervious surface (i.e., asphalt parking and roadway areas) and compacted soil in the developed areas and the lack of manmade or natural channels on site. However, the Tracy Station area averages only **19.05 cm (7.5 inches)** of rainfall annually; runoff usually is nonexistent, although a stormwater management plan has been developed.

Stormwater, if any, is controlled on site to prevent any discharge to the Truckee River. The drainage pattern on the property is controlled by graded slopes, which split surface runoff northwesterly and northeasterly of the generating units. Surface runoff flowing northwesterly splits into two flow paths, an unlined swale and a well-developed gully that convey runoff to the cooling pond. Surface runoff flowing around the east side of the generating units drains into a storm sewer system through drop inlet catch basins and is routed through an oil/water separator before discharging to the cooling pond. The

Table 3.4-1. Sources of water discharged to Tracy Power Station ponds.

DISCHARGES TO THE COOLING POND			
Source	Estimated Flow	Process	Comments
Service Water	400-500 acre-feet/year (0.56-0.70 cfs) depending on outside ambient temperature and cooling requirements.	Well water is used for indirect cooling of bearings, oil, and to maintain cooler temperature in the well water tank.	Not treated (no direct contact with equipment).
Floor drains	All of the floor drains in the plant (except those in the chemical area, which go to the evaporation pond) normally flow at zero except when washing a floor or draining a feed water heater or oil cooler.	Water can be well water, condensate, or circulating water (cooling pond water).	Oil trapped in the oil separators is collected for recycling. The floor drain system carries the sample station drains on Units #1 and #2 and some of the service water returns.
Sample table drain #1 and #2	100,000 gallons/month.	From boiler plant steam and water sampling points.	Condensate from the boiler plant.
Circulating water systems for Units #1 and #2	0-64,000 gallons/min. (0-143 cfs) depending on what units are running and their load.	Closed loop system water is pumped from the pond and returns to the pond.	Pond water is not treated except to chlorinate the condenser; most of this water is used to condense steam in the condenser, some is used to cool lube oil and hydrogen.
Pond make-up water	0-2,000 gallons/min. (0-4.45 cfs) depending on combined evaporation rate between the cooling towers and the pond. This rate depends on the heat load (primarily the condenser heat rejection) on the pond and the towers and on the ambient temperatures to which the pond and towers are rejecting heat.	Water comes from the Truckee River.	Not treated.

Table 3.4-1. Sources of water discharged to Tracy Ponds (continued).

DISCHARGES TO EXISTING EVAPORATION POND			
Source	Estimated Flow	Process	Comments
Demineralizer wastewater	22 acre-feet/year (0.03 cfs).	Comes from regenerating the demineralizer.	Is treated with 4 percent caustic on some and 4 percent sulfuric acid on others but is pH neutral when it enters the pond.
Boiler blowdown tanks	2 acre-feet/year (0.003 cfs).	Comes from boiler blowdown.	This is condensate from the boiler.
Sample table drain #3 unit	4.5 acre-feet/year (0.006 cfs).	Comes from various boiler plant samples.	This is condensate from the boiler plant.

cooling pond can accommodate approximately 43 acre-feet of run-off without overflowing. The oil/water separator is inspected periodically; tanks are pumped out by a used oil recycling contractor when maintenance is required.

Monitoring of selected water quality constituents of the Truckee River, the two water-supply wells on site (Wells 1 and 3), and the cooling pond occurs at regular intervals. Sample analyses include pH, conductivity, alkalinity (carbonate and bicarbonate), salinity, hardness, calcium (Ca), silica (SiO<sub>2</sub>), phosphate (PO<sub>4</sub>), and sulfate (SO<sub>4</sub>). Results of recent chemical analyses of water samples taken from the Truckee River, the cooling pond, and the evaporation pond during May through September 1993 are presented in Tables 3.4-2a and 3.4-2b and described below.

Samples collected from the Truckee River from 1986 to 1993 have exhibited considerable variability. The pH values indicate that the river fluctuates between pH 7 at high flows and pH 9.5 at very low flows. The levels of constituents found in these river samples show a strong negative correlation with flow, particularly conductivity, bicarbonate alkalinity, hardness, and pH. This probably occurs because high-flow events (e.g., snowmelt, thunder storms) often take place in the spring and summer and dilute the mineralized groundwater that dominates low-flow conditions.

# Piñon Pine Power Project

**Table 3.4-2a. Results of chemical analyses of surface water samples collected in May 1993 (in mg/L).**

Analytical Parameter	Evaporation Pond		Cooling Pond			Truckee River	
	1	2	SB (1)	NB (2)	WB (3)	B/1 bridge	UR 1/2 up
	5/2-3/93	5/2-3/93	5/2-3/93	5/2-3/93	5/2-3/93	5/2-3/93	5/2-3/93
<i>pH</i>	2.94	2.93	8.3	8.42	8.41	7.23	7.14
<i>Conductivity</i> ( $\mu\text{mho/cm}$ )	14800	(dup)	1250	1270	1290	105	100
<i>TDS</i>	17920	18254	941	944	943	76	76
<i>Hardness (CaCO<sub>3</sub>)</i>	1424	1490	387	384	384	48	48
<i>Alkalinity (CaCO<sub>3</sub>)</i>	0	0	85	86	85	41	41
<i>Bicarbonate alk.</i>	0	0	85	78	76	41	41
Bicarbonate ion	0	0	104	95	93	50	50
<i>Carbonate alk.</i>	0	0	0	8	8	0	0
Carbonate ion	0	0	0	5	5	0	0
Phosphorus, total	0.48	1.8	0.085	0.087	0.091	0.094	0.084
Silica, total	146	147	38	37	37	22	22
Iron	12	13	0.12	0.13	0.12	0.64	0.95
Chloride	440	444	138	139	141	12	12
Sulfate	11800	11900	440	433	438	8.8	9
Calcium	290	300	89	88	88	12	12
Magnesium	170	180	40	40	40	4.4	4.3
Sodium	5100	5300	150	160	150	12	11
Potassium	120	130	32	31	34	3	2.9
Arsenic	0.018	0.018	0.022	<0.005	0.021	<0.005	<0.005
Boron	2.4	2.5	1.2	1.2	1.3	1.2	0.14
Cadmium	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	0.05	0.048	<0.025	<0.025	<0.025	<0.025	<0.025
Copper	0.11	0.13	<0.025	0.026	<0.025	<0.025	<0.025
Lead	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	<0.005	<0.005	<0.005	0.0064	0.0065	<0.005	<0.005
Strontium	2.1	2.4	0.84	0.8	0.82	0.11	0.12
Zinc	0.073	0.086	<0.05	<0.05	<0.05	<0.05	<0.05
Total Ions (avg) meq/L	255.5	262	14.9	15	14.95	1.43	1.425
Error (%)	0.94	0.63	1.1	2.6	1.0	6.2	5.7

Note: Italics indicate parameters measured in the field (e.g., conductivity) or calculated (e.g., alkalinity).  
SB Southeast point      B Just west of bridge  
NB Northern-most point      UR Approximately 914 meters (3,000 feet) west of bridge  
WB Northwest point

**Table 3.4-2b. Results of chemical analyses of surface water samples collected in September 1993, field-filtered (in mg/L).**

Analytical Parameter	Evaporation Pond	Cooling Pond			Truckee River		Field Blank	
		SB	NB	WB	Bridge	U (up)	FB	
		9/2/93	9/3/93	9/3/93	9/3/93	9/3/93	9/3/93	9/3/93
pH	2.64	8.52	8.53	8.52	8.55	8.65	8.1	5.94
<i>Hardness (CaCO<sub>3</sub>)</i>	1760	360	340	342	89	92	95	0
<i>Alkalinity (CaCO<sub>3</sub>)</i>	0	88	88	89	93	95	98	4
<i>Bicarbonate alk.</i>	0	76	74	77	77	81	98	4
Bicarbonate ion	0	93	90	93	94	99	120	4.9
<i>Carbonate alk.</i>	0	12	14	12	16	14	0	0
Carbonate ion	0	7	8.4	7.2	9.6	8.4	0	0
Chloride	709	113	114	110	20	20	21	<
Phosphorus, total	1.6	0.12	0.1	0.099	0.08	0.08	0.064	0.037
Sulfate	16900	386	380	378	26	26	26	<5
Calcium	360	85	80	81	23	24	25	<1
Magnesium	210	36	34	34	7.6	7.8	7.9	<0.1
Sodium	6700	130	120	120	26	26	27	<1
Potassium	170	26	26	26	5.3	5	5.1	<1
Iron	27	<0.05	<0.05	<0.05	<0.05	0.082	<0.05	<0.05
Arsenic	<0.005	0.021	0.019	0.02	0.0098	0.012	0.0098	<0.005
Barium	<0.1	0.13	0.13	0.12	<0.1	<0.1	<0.1	<0.1
Boron	3.6	1	1.1	1.1	0.31	0.31	0.34	<0.1
Cadmium	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	0.055	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Copper	0.12	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lead	<0.2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	5	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Selenium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silica, total	180	62	64	65	23	23	22	0.27
Silver	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Strontium	2.8	0.72	0.75	0.71	0.18	0.18	0.2	0.1
Zinc	0.17	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	0.27	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Ions (avg meq/L)	333	13.25	12.8	12.7	3	3.06	3.15	0.042
Error (%)	3.5	2.1	0.78	0.02	1.3	1.5	1.6	NA

Notes: Italics indicate parameters measured in the field (e.g., conductivity) or calculated (e.g., alkalinity). A field blank serves quality control purposes.

SE	Southeast point	B	Just west of bridge
NB	Northern-most point	UR	Approximately 914 meters (3,000 feet) west of bridge
WB	Northwest point		

Analytical data collected from July 1986 through June 1993 (most recent data presented in Tables 3.4-2a and 3.4-2b) have exhibited increasing levels of some dissolved constituents in the cooling pond, especially conductivity and calcium and sulfate concentrations. This is related to changes in plant operation (e.g., running more cycles of concentration), high evaporation losses to the atmosphere, and the fact that the circulation water system is a closed loop (zero discharge) system, with resultant concentration of these naturally occurring salts in the remaining water.

To determine if cooling pond seepage was reaching the Truckee River, a water quality modelling study was conducted in 1993 [see Appendix F and the Technical Report on Water Quality, available in the reading rooms (see Appendix H)]. Using a water balance estimate of 0.24 cfs from the pond into the river (predicted by the calibrated model U.S. Geological Survey finite-difference modular groundwater flow model, MODFLOW), the calculated inflow is less than 0.1 percent of the flow in the river (at normal flow conditions of over 400 cfs). According to the model, even at a very low flow in the river (e.g., 40 cfs), the estimated seepage would amount to only 0.5 percent of the river flow. Sampling conducted from July 1986 through June 1993 indicates that conductivity in the *Truckee River* ranges from between approximately 75  $\mu\text{mho/cm}$  and 1,400  $\mu\text{mho/cm}$  with most of the samples falling in the 200-300  $\mu\text{mho/cm}$  range. For specific results and scattergrams, see the Technical Report on Water Quality, available in the reading rooms listed in Appendix H. Even at high levels of specific conductance (representing high dissolved solid concentrations) measured in the cooling pond, for example, which reached 1,800  $\mu\text{mhos/cm}$ , the estimated mixing of cooling pond water into the river would increase its conductance only 1.8 to 18  $\mu\text{mhos/cm}$  if the water passed through unaffected by ion exchange in the soil. This amount is not significant compared to the 200 to 300  $\mu\text{mhos/cm}$  normally found in the Truckee River. In addition, most of the chemical constituents found in the cooling pond occur naturally in the Truckee River. In the river, dissolved solids consist primarily of bicarbonate alkalinity, silica ( $\text{SiO}_2$ ), chloride (Cl), calcium (Ca), and sodium (Na) ions.

There are insufficient data to identify water quality trends in the evaporation pond at the Tracy Power Station. Available analytical results (taken in 1979 and 1992) indicate that the pH of the evaporation pond has decreased substantially from being slightly basic (pH = 8.6) in 1979 to very acid (pH = 3) in 1992. This has been attributed to an operational function associated with neutralizing back-flushed water from the demineralizer unit. Makeup boiler feedwater is demineralized by a package that includes neutralization controls. Acid and caustic pumps are used for neutralization before the regeneration waste is sent to the evaporation pond. These system parameters recently have been upgraded, and the pond is now being chemically neutralized to a target of pH 7.

### 3.4.3 Groundwater

Groundwater constitutes a major portion of the Truckee River Basin water resources, with the Truckee River as the main contributor to groundwater flows. Many private wells serve individual residences throughout the watershed, both in the alluvial valley-filled deposits (aquifers) and in fracture zones of otherwise less pervious rocks (*California Department of Natural Resources, 1991*). Municipal surface water supplies are augmented with groundwater sources.

Groundwater at Tracy Station is obtained from two wells (No. 1 and No. 3) located on site (see Figure F-1 in Appendix F). The No. 1 wellhead is situated near the river make-up station. The No. 3 wellhead is located uphill near the fuel tanks. (Well No. 2 is an observation point.) Well water is used for domestic and process water purposes. Information on these three wells is provided in Table 3.4-3.

**Table 3.4-3. Tracy Power Station wells.**

Well #	Surface Elevation (ft MSL)	Total Depth (ft)	Screened Intervals	Diameter (inches)	Depth to Water (ft)	Yield (gpm)
1	4253 (estimate)	135	26-133	16/14	7.3-10.6	200
2	N/A	N/A	N/A	N/A	N/A	N/A
3	4280 (estimate)	200	30-150	10.75	40.5	100-200

*Because* the water quality in existing Well No. 1 is insufficient, the water cannot be used for make-up or for the demineralizer and it does not meet drinking water standards. Therefore, a new well *near the maintenance shops* will be drilled in 1994 and will replace existing Well No. 1, which will be capped and remain unused. The new well will use existing water rights. If the well produces potable water, bottled water will be discontinued as a source of drinking water. In addition to being used for drinking water, the new well will supplement Well No. 3 and be used for domestic and general plant uses.

To obtain geologic, hydrologic, and chemical data that would adequately characterize existing groundwater conditions, 12 monitoring wells were installed (see Figure F-1 in Appendix F). The wells were used to obtain soil samples; test the aquifer; measure groundwater levels; determine groundwater

flows; and obtain groundwater samples for pH, temperature, and specific conductance testing. The results of groundwater level measurements in the monitoring wells are shown in Table F-1 of Appendix F. Groundwater quality data from these monitoring studies are presented in Tables 3.4-4a through -4d. Additional details regarding the groundwater quality data are provided in Appendix F.

Three main factors influence groundwater hydrology at the site: the Truckee River; the cooling pond; and site geology (interbedded deposits). Groundwater quality is a function of the geochemical regime (such as its anoxic (lack of oxygen) conditions and interaction with aquifer materials, especially carbonates which modify the quality of groundwater that enters the system). Infiltration from the Truckee River is the general source for groundwater beneath the site; the general groundwater gradient, therefore, is governed by the Truckee River. The cooling pond has a widespread mounding effect whereby the groundwater is slightly higher in the area surrounding the pond. As a result, the groundwater contours are pulled in an easterly direction. The cooling pond also influences groundwater quality at the site. Observed changes in groundwater quality in nearby water-supply Well No. 1 mirror those seen in the cooling pond, which has shown a rapid rise in a number of constituents, such as calcium (Ca). However, Well No. 3 (downgradient of the cooling pond) water quality indicates that the cooling pond groundwater quality influence is very local because the constituent levels in this well are relatively low and stable. The main geological constraint on the system is the generally variable nature of the subsurface, which apparently consists of materials ranging from very coarse materials (possibly colluvial in origin) near the canyon walls, to silty or clayey materials, in pockets near the center of the area. Through groundwater level measurements, a high groundwater gradient was observed across a zone that includes the subsurface beneath the evaporation pond, indicating that the permeability of material beneath the existing evaporation pond is significantly lower than the permeability of material elsewhere at the site (see Figure F-2 in Appendix F). In addition, the uniformity of the gradient in the immediate vicinity of the evaporation pond indicates that there is no detectable leakage from the evaporation pond sufficient to result in mounding of groundwater beneath the pond.

Groundwater flow in the Truckee River Canyon is predominantly in the same easterly direction as the river. Groundwater flow along the canyon is between 5.9 cfs (4,214 acre-feet/year) coming in from the western end and 12 cfs (8,571 acre-feet/year) exiting the eastern end. Groundwater withdrawal by the Tracy Power Station amounts to approximately 0.6 cfs (428 acre-feet/year). Groundwater recharge by seepage from the cooling pond is approximately 0.8 cfs (571 acre-feet/year), with approximately one-third of the seepage potentially moving toward the river and two-thirds heading away from the river toward the southeast, based on projected flow directions.

Table 3.4-4a. Results of chemical analyses of groundwater samples from the May 1993 sampling round (in mg/L).

	MW-01	MW-02	MW-03	MW-04	MW-05	MW-06	MW-07	MW-08	MW-09 (1)	MW-09 (2)	MW-10 (1)	MW-10 (2)	MW-11	MW-12	Well 1	Well 3
	5/3/93	5/3/93	5/3/93	5/3/93	5/3/93	5/3/93	5/3/93	5/3/93	5/3/93	5/3/93	5/3/93	5/3/93	5/3/93	5/3/93	5/2-3/93	5/2-3/93
pH	7	6.58	6.73	6.86	6.81	6.73	7.19	6.63	6.64	6.68	7.03	6.95	7.5	6.77	7.18	7.21
Conductivity (umho/cm) (field measure)	600	3250	1550	850	1200	800	1400	1290	1300	(dup)	300	(dup)	1000	1350	1000	340
TDS (calc)	450	3425	1241	620	1017	551	999	982	1004	998	188	189	869	1002	699	225
Hardness (as CaCO <sub>3</sub> , calc)	213	1649	737	400	439	336	397	522	439	448	107	107	485	514	409	136
Alkalinity (CaCO <sub>3</sub> )	110	191	100	86	114	94	111	112	105	104	100	101	112	100	141	102
Bicarbonate alk.	110	191	100	86	114	94	111	112	105	104	100	101	112	100	141	102
Bicarbonate ion	134	233	122	105	139	115	135	137	128	127	122	123	137	122	172	124
Carbonate alk.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate ion	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phosphorus, total	0.078	0.033	0.068	0.027	0.016	0.05	0.31	0.099	0.047	0.12	0.079	0.075	0.076	0.074	0.038	0.084
Silica, total	46	40	41	46	37	42	43	35	40	40	59	59	50	33	45	62
Iron	1.1	1.5	3.4	3.7	12	0.075	1.2	0.21	0.09	<0.05	0.12	0.14	0.087	0.078	1.2	<0.05
Chloride	57	247	161	106	174	58	155	171	165	162	16	17	152	172	113	25
Sulfate	168	1960	619	266	463	255	443	437	458	453	38	38	380	453	270	55
Calcium	49	380	170	94	110	80	93	130	110	110	23	23	110	130	98	28
Magnesium	22	170	76	40	40	33	40	48	40	42	12	12	51	46	40	16
Sodium	78	530	140	50	150	58	170	120	150	150	29	29	90	130	81	29
Potassium	8.4	23	14	11	9.9	8.6	30	7.1	17	17	8.2	8.2	17	10	10	10
Arsenic	<0.005	<0.005	<0.005	<0.005	0.047	<0.005	0.017	<0.005	<0.005	<0.005	0.0056	0.0055	<0.005	<0.005	<0.005	<0.005
Boron	0.48	1.4	1.3	0.44	1.2	0.53	1.5	1.3	1.3	1.3	0.26	0.26	1.2	1.4	0.93	0.22
Cadmium	0.008	0.016	0.068	0.022	<0.0005	0.033	0.0014	0.017	<0.0005	<0.0005	0.0006	0.0006	0.0056	0.013	0.0005	<0.0005
Chromium	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Copper	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lead	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	<0.005	<0.005	0.018	0.017	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	0.33	3.1	0.97	0.77	1	0.64	0.84	1	0.94	0.97	0.32	0.19	0.84	0.87	0.8	0.24
Zinc	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.076	<0.05
Total Ion (avg) (meq/L)	7.6	54.05	20.3	10.3	16.2	9.1	15.95	16	16	16	3.4	4.5	14.2	16.25	11.8	4.05
Error (%)	3.7	4.7	4.3	0.95	3.9	3.4	0.93	1.0	1.7	0.52	5.3	4.7	1.4	0.27	1.4	4.3

Note: Italics indicate parameters measured in the field (e.g., conductivity) or calculated (e.g., alkalinity).

Table 3.4-4b. Results of chemical analyses of groundwater samples from the July 1993 sampling round: total metals, unfiltered (in mg/L).

	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11	MW-12
	7/26/93	7/29/93	7/26/93	7/26/93	7/29/93	7/29/93	7/29/93	7/29/93	7/26/93	7/30/93	7/29/93	7/29/93
Arsenic	0.0070	0.0084	0.023	0.0077	0.070	<0.005	0.035	0.021	0.0054	0.0068	<0.005	0.013
Cadmium	0.0070	0.00064	0.032	0.0039	0.045	0.025	0.14	0.0091	0.0012	0.0090	0.00085	0.0032
Calcium	56	170	120	130	98	90	82	120	99	26	110	106
Chromium	<0.025	<0.025	<0.025	<0.025	0.034	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Copper	<0.025	<0.025	<0.025	<0.025	0.045	<0.025	<0.025	<0.025	0.033	<0.025	<0.025	<0.025
Iron	17	32	72	48	86	27	43	32	17	5.7	12	29
Lead	<0.005	<0.005	<0.005	<0.005	0.016	0.0084	0.026	<0.005	<0.005	<0.005	<0.005	0.0060
Magnesium	25	64	48	52	42	35	39	47	36	12	40	40
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Potassium	8.8	18	15	14	14	8.8	30	7.7	15	7.9	12	10
Selenium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Sodium	100	290	140	65	150	53	120	110	140	30	86	100
Strontium	0.39	1.3	0.86	1.1	1.1	0.71	0.85	1.1	0.84	0.21	0.96	0.91
Zinc	<0.05	0.058	0.065	0.097	0.20	0.062	0.13	0.087	<0.05	<0.05	<0.05	0.059

Table 3.4-4c. Results of chemical analyses of groundwater samples from the July 1993 sampling round: dissolved metals, filtered (in mg/L).

	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11	MW-12
	7/26/93	7/29/93	7/26/93	7/26/93	7/29/93	7/29/93	7/29/93	7/29/93	7/26/93	7/30/93	7/29/93	7/29/93
Arsenic	<0.005	<0.005	<0.005	<0.005	0.037	<0.005	0.015	<0.005	<0.005	0.0069	<0.005	<0.005
Cadmium	0.0015	<0.0005	0.0045	<0.0005	<0.0005	0.0062	<0.0005	0.0079	<0.0005	0.0060	<0.0005	<0.0005
Calcium	54	160	120	120	85	80	74	120	97	24	110	100
Chromium	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Copper	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Iron	<0.05	<0.05	<0.05	<0.05	4.4	<0.05	0.097	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Magnesium	21	61	41	43	31	31	32	43	32	12	39	37
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Potassium	7.7	16	14	11	12	7.8	28	5.0	14	7.8	11	9.3
Selenium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Sodium	100	290	140	69	140	54	130	120	140	30	100	120
Strontium	0.34	1.2	0.70	0.85	0.79	0.63	0.70	0.95	0.75	0.18	0.88	0.74
Zinc	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Table 3.4-4d. Results of chemical analyses of groundwater samples from the third sampling round, field-filtered (in mg/L).

	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11	MW-12	TW-1	TW-2	TW-3	Well 1	Well 3
	9/1/93	9/3/93	9/2/93	9/1/93	9/3/93	9/1/93	9/3/93	9/3/93	9/3/93	9/1/93	9/1/93	9/3/93	9/2/93	9/2/93	9/2/93	9/3/93	9/2/93
pH	7.32	6.75	6.78	6.84	7.2	6.99	7.1	7.33	7.25	7.1	7.52	6.84	7.03	7.12	7.99	7.39	7.35
Hardness (CaCO <sub>3</sub> )	218	535	526	452	419	309	327	352	435	349	100	431	402	393	47	151	136
Alkalinity (CaCO <sub>3</sub> )	108	123	122	92	92	108	94	104	113	102	106	102	96	97	98	112	106
Bicarbonate alk.	108	123	122	92	92	108	94	104	113	102	106	102	96	97	98	112	106
Bicarbonate ion	132	150	149	112	112	132	115	127	138	124	129	124	117	118	120	137	129
Carbonate alk.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonate ion	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chloride	86	147	149	140	134	124	73	123	128	118	19	135	131	130	8.5	24	28
Phosphate, total	0.072	0.075	0.075	0.059	0.085	0.46	0.082	0.23	0.14	0.14	0.087	0.094	0.11	0.1	0.082	0.088	0.074
Sulfate	205	678	676	457	314	356	248	398	407	381	48	389	407	410	22	76	56
Calcium	51	130	130	110	100	76	80	80	110	87	22	110	100	98	11	34	28
Magnesium	22	51	49	43	41	29	31	37	39	32	11	38	37	36	4.8	16	16
Sodium	90	200	200	130	55	150	53	130	120	140	27	97	130	120	40	33	30
Potassium	7.7	14	14	13	9.3	12	7.7	29	4.4	14	7.7	9.7	10	10	7.1	8.4	9.9
Iron	<0.05	<0.05	0.1	<0.05	0.12	4.7	<0.05	0.38	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.056
Arsenic	<0.005	<0.005	<0.005	<0.005	<0.005	0.05	<0.005	0.018	0.005	0.005	0.0057	<0.005	<0.005	<0.005	0.014	0.005	0.0053
Barium	<0.1	<0.1	<0.1	<0.1	0.18	<0.1	<0.1	0.19	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Boron	0.5	1.3	1.3	1.3	0.69	1.4	0.57	1.1	1.3	1.3	0.28	1.3	1.3	1.3	0.21	0.31	0.24
Cadmium	0.0011	<0.0005	<0.0005	0.00054	<0.0005	0.00057	0.00057	0.00057	0.0016	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Copper	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lead	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	0.032	<0.03	<0.03	0.031	<0.03	3.4	<0.03	0.31	0.13	2.6	<0.03	<0.03	0.071	0.072	<0.03	<0.03	1.5
Selenium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silica, total	43	37	37	40	48	39	41	50	35	35	56	41	33	33	59	56	40
Silver	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Strontium	0.36	0.89	0.90	0.68	0.84	0.71	0.65	0.75	0.87	0.74	0.19	0.86	0.72	0.71	<0.1	0.3	0.24
Zinc	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Ions (avg) meq/L	8.66	20.2	20.15	15.15	11.55	13.05	9.07	13.6	14.15	13.35	3.51	13.5	14	13.7	2.76	4.58	4.17
Error (%)	2.2	2.4	2.8	0.91	5.0	0.21	0.32	1.5	1.1	0.51	3.9	3.1	0.47	2.9	3.6	1.7	2.4

Note: Italics indicate parameters measured in the field (e.g., conductivity) or calculated (e.g., alkalinity).

#### **3.4.4 Floodplains**

Floodplains are relatively flat lowland areas adjoining inland and coastal waters and other floodprone areas. At a minimum, floodplains are areas subject to a one percent or greater chance of flooding in any given year. Seasonal flooding in the region is the result of a storm or series of storms, with warm rains that lead to the rapid melting of the winter snowpack. This type of flooding affects the Truckee River in particular. Episodic flooding typically occurs as a result of heavy rainstorms. In these cases, the flooding is generally localized and in small drainage systems. The Truckee River in the Reno-Sparks-Truckee Meadows area has a long history of floods. The largest flood occurred in December 1955 with a peak flow of 20,800 cfs. Floods of 19,000 cfs (November 1950) and 18,400 cfs (February 1963) also have been recorded.

Flow measurements recorded at the Tracy gauge provide daily average flows of the Truckee River in the proposed project area. The lowest flow during the period of record (May 1972 through June 1993) was 36 cfs on July 25 to 26, 1992, and the highest was 16,000 cfs recorded on February 19, 1986. The maximum flow in the Truckee River occurs in May, related to peak snowmelt periods in the higher elevations of the Truckee River watershed, while low flows typically occur in September or October.

Floods and low flows of significant return periods are estimated to be as follows:

100-year flood	= 21,030 cfs
10-year flood	= 12,300 cfs
10-year low flow	= 20 cfs
100-year low flow	= 12 cfs.

DOE regulation 10 CFR Part 1022 requires that a floodplain determination be made using Flood Insurance Rate Maps, or Flood Hazard Boundary Maps prepared by the Federal Emergency Management Agency (FEMA). A review of the FEMA floodplain map for this area (Community-Panel Number 320033 0020 B — February 19, 1987) indicates that portions of the existing Tracy Power Station are within both the 100- (1 percent chance) and 500-year (0.2 percent chance) floodplain boundaries for Storey County. Several existing structures are located in the 100-year floodplain as defined on the FEMA map, including the No. 2 cooling tower, the No. 1 well pump station, the river make-up station, and the

electrical switchyard for Units #1 and #2. The access road located northeast of the generating units also is in the 100-year floodplain (see Figure 3.4-2).

Since 1962, the area north of the Truckee River has been graded with the fill removed from the floodplain. The area south of the river has been raised with fill and gravel. These actions may have effectively moved the floodplain boundary to the north and off of the site, but this has not yet been verified by FEMA, or other agencies with floodplain determination expertise such as the Army Corps of Engineers (ACOE), Soil Conservation Service (SCS), or the Bureau of Reclamation. Since the grading and sitework took place, SPPCo. has added two combustion turbines and three steam-electric generating units and their related equipment.

### 3.4.5 Wetlands

The National Wetland Inventory (NWI) maps produced by the USFWS were reviewed for wetland identification at Tracy Power Station and the surrounding area. The NWI maps identified open water wetlands as the artificially created cooling pond (31.5 acres), make-up station pond (0.3 acres), and evaporation pond (4.5 acres). The NWI maps classify these wetlands as non-tidal permanent palustrine and lacustrine open water wetlands that support hydrophytic vegetation. A total of 42.2 acres of Federal jurisdictional wetlands were identified in a field survey in the Spring of 1993 using the 1987 ACOE Manual. It should be noted that the ACOE has not verified the field survey for wetlands. The field survey identified 36.3 acres of open water wetlands and 5.9 acres of riparian habitat on the southern bank of the Truckee River (see Figure 3.4-3). The dominant species bordering the ponds are upland grasses and forbs. Broadleaf peppergrass, and scattered cottonwood and willow seedlings and saplings are the predominant wetland plant species. The wetland indicator status of plant species identified during the survey is presented in Table 3.4-5. Soils near the ponds do not have common hydric soil characteristics (i.e., no mottling or gleying), however, they are considered hydric because of their link to continually inundated pond areas.

Wetland habitat on the southern bank of the Truckee River is predominantly scrub/shrub riparian habitat. This area is described by NWI maps as palustrine scrub/shrub and forested wetlands consisting primarily of broadleaf deciduous species. Specific wetland vegetation identifications included sandbar willow (*Salix exigua*), Pacific willow (*S. laisandra*), Booth's willow (*S. Boothii*), and Fremont's cottonwood. Herbaceous species included cottonwood and willow seedlings and saplings, broadleaf peppergrass, cattails (*Typha sp.*), rushes, and sedges. As with the open water areas, the soils associated



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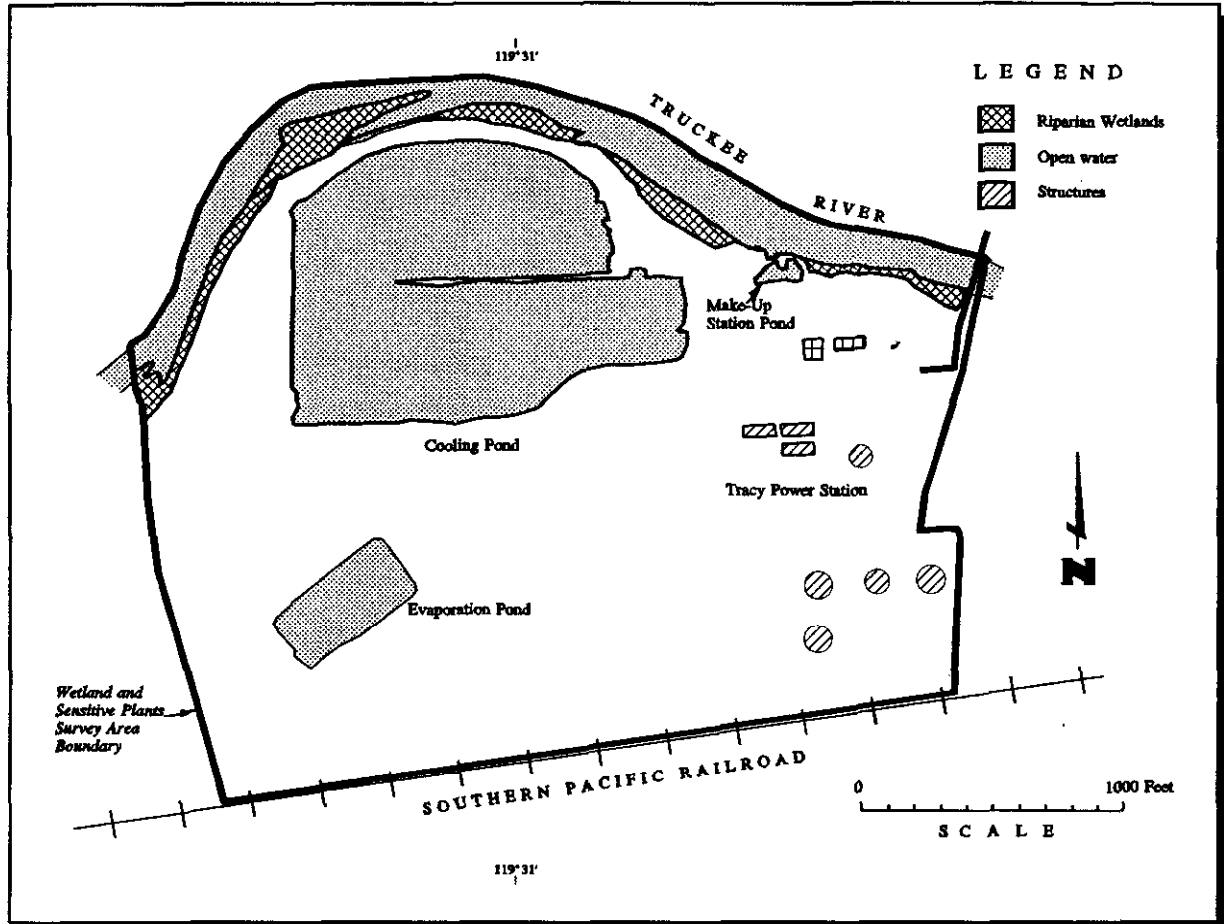


Figure 3.4-3. Location of wetlands.

with riparian wetlands did not exhibit typical hydric soil characteristics, but were considered hydric because of their association with the river channel.

Water flow in the Truckee River channel is the main source of wetlands hydrology for this community. High flows and flooding were evidenced by high water marks and debris accumulation. Seasonal flooding and overflow from the river supports wetland vegetation on the stream bank and in the floodplain.

Table 3.4-5. Plant species observed in wetlands delineated during the May 1993 survey.

Scientific Name	Common Name	Indicator Status
<i>Carex spp.</i>	sedge	FACU-OBL
<i>Distichlis spicata</i>	inland saltgrass	FAC
<i>Elymus glaucus</i>	bunch grass	FACU
<i>Elymus triticoides</i>	creeping wildrye	FAC
<i>Hordueum jubatum</i>	foxtail	FAC
<i>Juncus spp.</i>	rush	FACW-OBL
<i>Lepidium latifolium</i>	broadleaf peppergrass	FAC
<i>Mentha spicata</i>	penny royal	FACW
<i>Populus fremontii</i>	Fremont's cottonwood	FACW
<i>Salix boothii</i>	Booth's willow	OBL
<i>Salix exigua</i>	sandbar willow	OBL
<i>Salix lasiandra</i>	Pacific willow	OBL
<i>Salsola kali</i>	Russian thistle	FACU
<i>Sarcobatus vermiculatus</i>	greasewood	FACU
<i>Sisymbrium altissimum</i>	tumbling mustard	FACU
<i>Typha sp.</i>	cattails	OBL

**Legend**

FACU: Facultative upland plants, usually occur in non-wetlands but occasionally are found in wetlands.

FAC: Facultative plants, equally likely to occur in wetlands or non-wetlands.

FACW: Facultative wetland plants, usually occur in wetlands but occasionally are found in non-wetlands.

OBL: Obligate wetland plants, nearly always found in wetlands.

### 3.5 Land Use

This section describes the land use patterns and trends in the vicinity of the proposed project that currently occur or are anticipated. Current traffic and transportation baselines also are presented. Existing land uses in the River District of Storey County include agriculture, recreation, residential, industrial, and commercial development. The development potential of this area is enhanced by its

## **Piñon Pine Power Project**

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proximity to the Truckee River, Reno/Sparks metropolitan area, I-80, and the Southern Pacific transcontinental railway. Residential development generally is located in the Lockwood-Mustang area, to a lesser extent in the Patrick area, and also in some agricultural areas (*Storey County, 1993*). Sand and gravel pits that supply construction projects in the Reno/Sparks area, are located along the banks of the Truckee River. The area east of Chalk Bluff is a level riparian area where the Tracy Power Station and McCarran Ranch (a low density residential area) are located. The McCarran Ranch covers an area of more than 1,800 acres [approximately 4.8 km (3 square miles)] in both Storey and Washoe Counties between Chalk Bluff (approximately 4.8 km (3 miles) west of Tracy Station) and the Tracy Power Station boundary. In addition to the ranch house, there are three occupied residences on ranch property. Most of the Truckee Canyon within the vicinity of the proposed project is zoned industrial. East of the Tracy Power Station is a diatomaceous earth industrial processing plant at the Clark railroad siding (diatomaceous earth is a white or cream-colored earth composed of diatom shells mined for use as a filter, filtering agent, absorbent, clarifier, or insulator) (*Storey County, 1993*). Transportation to the Tracy Station site is by rail or automobile. The site is adjacent to I-80 and is intersected by a Southern Pacific railroad line. Air transportation also is available, approximately 24 km (15 miles) west, at the Reno-Carson International Airport.

### **3.5.1 Existing Land Use**

The proposed Piñon Pine Power Project would be located adjacent to the existing Tracy Power Station on a 724-acre site owned entirely by the SPPCo. The site is approximately 27.4 km (17 miles) east of the Reno/Sparks area (population 250,000) and 24 km (15 miles) west of the town of Fernley (population 7,000). With an elevation of approximately 1,305 meters (4,282 feet) above sea level, the projected site is located in rural Storey County in the Truckee River Canyon on flat terrain that abuts the Truckee River. The outlying area is classified as semi-arid, high desert, typical of the Great Basin Region. Clark Mountain, the largest feature in the area [elevation of 2,193 meters (7,195 feet)], is located approximately 6 km (3.5 miles) to the south of the plant.

Although this area has been zoned industrial, most of the canyon is undeveloped and utilized for open livestock grazing and wildlife habitat. Prominent land use features in this area are the Tracy Power Station, which includes three exhaust stacks, two cooling towers, four oil tanks, electrical generation units, powerline towers and conductors, two switching stations, and outbuildings. Approximately 1.6 km (1 mile) to the east of the power station lies a diatomaceous earth processing plant at the Clark railroad siding; diatomite is mined in the Virginia Mountain range to the south, and the extracting pits

are located approximately 8 km (5 miles) to the east of the plant. Three kilometers (2 miles) beyond Clark is Derby Dam, where water is diverted from the Truckee River to Lake Lahontan via the Truckee Canal. The McCarran Ranch (a low density residential area) is also in the immediate vicinity of the plant. In addition, two major sand and gravel aggregate removal and processing operations are located to the east and west of the project site.

The Pyramid Lake Indian Reservation covers approximately 306,273 acres and is located in eastern Washoe County. Its lands are administered by the Paiute Indian Tribal Council. Three other reservations also are located within 80 km (50 miles) of the proposed project site: the Yerington Indian Reservation, between Wabuska and Yerington; the Fallon Indian Reservation, east of Fallon; and the Walker River Indian Reservation, at Schurz, north of Walker Lake. Additionally, the Reno-Sparks Indian colony owns approximately 160 acres of land in Lemon Valley and approximately 1,920 acres in Hungry Valley.

The Desolation Wilderness Area (a Class I area) and the Stillwater National Wildlife Management Area are within a 100-km (62 mile) radius of the plant. Desolation Wilderness is located in California and is approximately 106 square miles (68,000 acres). The area is primarily used for recreation and wildlife habitat and is managed by the U.S. Forest Service. In addition, the newly designated Mount Rose Wilderness Area (a Class II area) is also within the 100-km radius of the proposed plant. No other national parks, refuges, or wilderness areas occur within 100-km; however, there are a number of state and county parks in the region (see Figure 3.5-1). The only Class I area in Nevada is Jarbridge Wilderness Area, which is 410 km (255 miles) from Tracy Power Station. Grand Canyon National Park, a 1.2 million acre area in Arizona, is approximately 611 km (380 miles) away.

### **3.5.2 Land Use Trends and Controls**

The Tracy Power Station is located in the River District section of Storey County, NV. The River District extends approximately 40.2 km (25 miles) along the south bank of the Truckee River. Within the vicinity of the plant, the area is mostly undeveloped although it is zoned industrial. Unlike most of Nevada, 87 percent of which is managed by Federal agencies, approximately 90 percent of Storey County is privately owned. A variety of land uses (residential, agricultural, recreational, industrial, and commercial development) occur within the River District. Although no area in the River District is said to have a developed economy, considerable development has occurred resulting in businesses with employment opportunities, and development in this area is expected to continue. Consequently, Storey

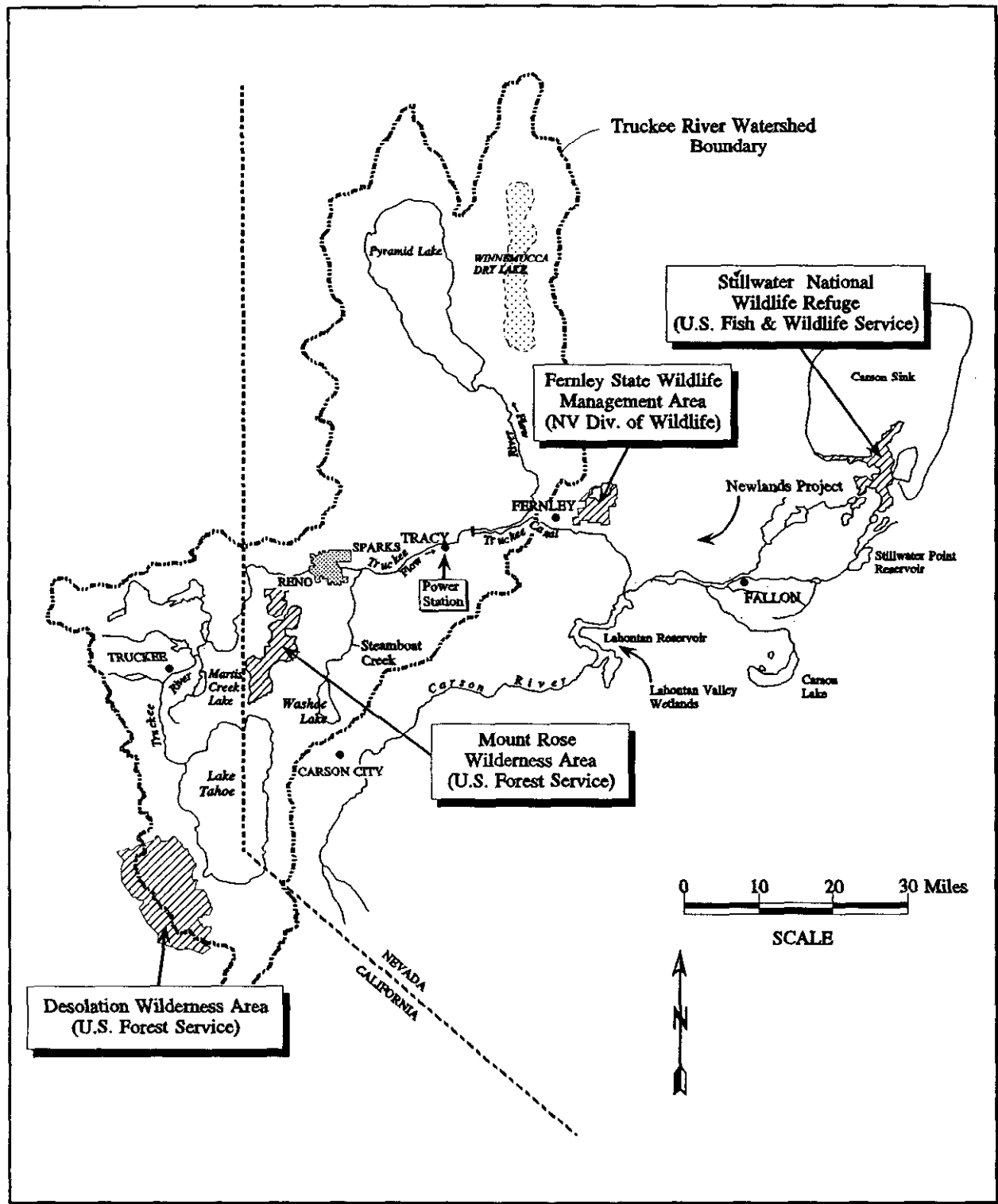


Figure 3.5-1. Location of wilderness and wildlife management areas.

County planning officials are considering the development of and zoning for an industrial park in the area. If development of this industrial park is pursued, county zoning ordinances would require Special Use Permits to regulate environmental impacts, noise levels, site control services, utilities, and circulation (*Storey County, 1993*). Currently, there are no existing plans for development to the south of the Tracy Power Station site (*as reported by the property owner's real estate broker*). However, this is an area of potential industrial development.

Nearby Lyon County consists of 2,024 square miles (1,295,360 acres), 72.4 percent of which is either exempt from local controls or owned by a governmental entity. Typical land uses in Lyon County include agriculture, industry, ranching, mining, recreation, and wildlife habitat. A major portion of the southern portion of Lyon County is part of the Toiyabe National Forest. Other significant Federal areas include Lahontan Reservoir, the Alkali Lake Wildlife Management Area, and the Mason Valley and Fernley Wildlife Management Areas (*Lyon County, 1990*).

To the immediate north, across the Truckee River in Washoe County; the area is zoned "tourist commercial". At this time, the land is undeveloped with no plans for development, and its primary use is open livestock grazing and wildlife habitat. Currently, approximately 51,449 acres of developed land exist in unincorporated Washoe County. Industrial growth, totalling 1,486 acres, is anticipated by the year 2007. Growth in Washoe County has followed a pattern of a large-lot residential development (usually larger than 1 acre) set among large farms/ranches and large tracts of publicly owned lands (*Washoe County, 1991*).

### **3.5.3 Transportation and Infrastructure**

SPPCo.'s Tracy Power Station is easily accessible by rail and automobile. The property is adjacent to I-80, a four-lane east-west highway that provides access to the site in either direction by Exit 32: Tracy-Clark Station (see Figure 3.5-2). Average daily traffic (ADT) volume counts (1992) for the affected area are summarized in Table 3.5-1.

Transportation-related construction plans include paving of the 9.6 km (6-mile) Canyon road from Virginia City to the Mark Twain area, and an all-year road from State Route 341 to the River District, linking the north and south ends of Storey County. The county recognizes the need for a road linking Virginia City with Lockwood, although no construction plans currently exist, and also recognizes the

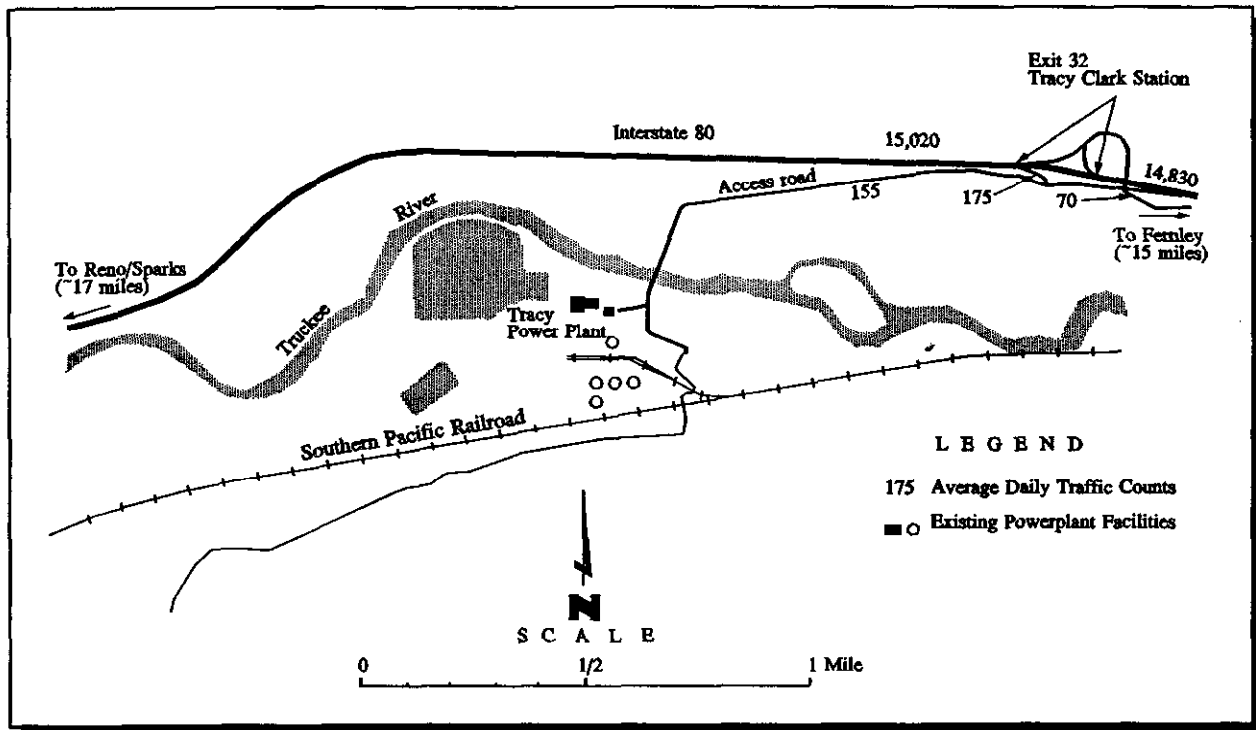


Figure 3.5-2. Existing transportation features.

Table 3.5-1. Average daily traffic surrounding the Tracy Power Station in 1992.

Primary Road	Direction	Average Daily Traffic (ADT)*
I-80	West of Tracy-Clark Interchange	15,020
I-80	East of Tracy-Clark Interchange	14,830
Tracy-Clark Station Exit	Eastbound	175
Tracy-Clark Station Exit	Westbound	70
Frontage Road	West of Tracy-Clark Interchange	155

\*Breakdown of number of automobiles and trucks included in these figures was not available.

complete absence of suitable access between the Truckee River area and Virginia City. Reconstruction and paving of the Largomarsino Road also is a primary consideration (*Storey County, 1993*).

Rail transportation is provided by the mainline of Southern Pacific Railroad, which transverses the property to the south of the proposed project site. In addition, a spur of this track is currently used to deliver fuel oil to the Tracy Power Station. Approximately 12 to 14 trains travel daily along this route. Air transportation via the Reno-Carson International Airport is available approximately 24 km (15 miles) west of the projected site.

### 3.6 Biological Resources and Biodiversity

This section describes the aquatic and terrestrial environments potentially impacted by the project. Aquatic ecosystems in the area primarily consist of the Truckee River and cooling ponds. Most of the terrestrial ecosystems in the area are highly disturbed from fire, grazing, and other land use activities. Northern desert shrub and salt desert shrub comprise most of the area; riparian wetlands represent 4 percent of the area. It was determined, through consultations with Federal and state agencies, that 5 sensitive plant species and 11 sensitive fish and wildlife species could exist in the area.

#### 3.6.1 Aquatic Ecosystems

Aquatic resources were inventoried through a review of existing literature, an angler survey, incidental field observations, and field surveys. Aquatic habitats in the survey area consist of the Truckee River, the 0.3-acre make-up station pond, and the 31.5-acre cooling pond. The 4.5-acre evaporation pond was identified, through aerial photographs, as wetlands and is included on the National Wetlands Inventory (NWI) map. It is a man-made lined structure intended to store wastewater and is not used as a fish or wildlife habitat. Channel catfish (*Ictalurus punctatus*), green sunfish (*Lepomis cyanellus*), largemouth bass (*Micropterus salmoides*), and common carp (*Cyprinus carpio*) have been documented in the cooling pond (*SPPCo., 1993d*). Results of angler surveys and fisheries studies of the cooling pond conducted in 1993 documented these same species, as well as mosquito fish (*Gambusia affinis*).

Fish species that occur in the Truckee River include Tahoe sucker (*Catostomus tahoensis*), carp, green sunfish, rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*) (*SPPCo., 1993d*), and the federally listed Lahontan cutthroat trout and Cui-ui sucker. The Cui-ui is found in the lower portion

of the river during spawning. Additionally, species documented during annual electrofishing surveys in the Truckee River near the Tracy Power Station include redbside shiner (*Richardsonius egregius*), Lahontan sucker (*Catostomus platyrhynchus*), speckled dace (*Rhinichthys osculus*), and mosquito fish (NDOW, 1989; 1990; 1991; 1992). Mountain whitefish (*Prosopium williamsoni*) and sculpin (*Cottus* spp.) have been documented further upstream (NDOW, 1989; 1990; 1991; 1992). The Truckee River is regularly stocked by the Nevada Division of Wildlife (NDOW) with both brown trout and rainbow trout (SPPCo., 1993d).

### **3.6.2 Terrestrial Ecosystems**

Most of the site consists of highly disturbed northern desert shrub/salt desert shrub communities, where the native vegetation is represented by big sagebrush (*Artemisia tridentata*), rabbitbrush (*Chrysothamnus viscidiflorus* and *C. nauseosus*), and saltbrush (*Atriplex canescens*). Historically, development and disturbance to soils and associated habitats have resulted in the native vegetation on site being largely replaced by exotic weed species such as Russian thistle (*Salsola kali*), yellow rocket (*Bassia* sp.) (JBR, 1993), and broadleaf peppergrass (*Lepidium latifolium*). A narrow riparian band consisting of Fremont's cottonwood (*Populus fremontii*), willows (*Salix boothii*, *S. exigua*, and *S. lasiandra*), rushes (*Juncus bufonius* and *J. balticus*), and sedges (*Carex* spp.) borders the Truckee River along the north edge of the site.

Surveys to identify fauna, flora, and terrestrial habitats were conducted during March, May, June, and October, 1993, in an area covering 545.5 acres at and surrounding Tracy Power Station (see Figure 3.6-1). Both species and habitat types were investigated to obtain a better assessment of the extent of biodiversity. The Truckee River and the Southern Pacific Railroad formed the northern and southern boundary of the site, respectively.

The majority of the biological survey area is largely denuded or contains invader-type species such as cheatgrass and Russian thistle (see Table 3.6-1 and Figure 3.6-1). Open water habitats, including the Truckee River and constructed ponds, are subdominant (23 percent), with lesser amounts of big sage desert shrub communities (15.2 percent), and greasewood desert shrub communities (9.4 percent). Riparian wetlands, including cottonwood trees and scrub/shrub wetlands, represented 4 percent of the survey area.

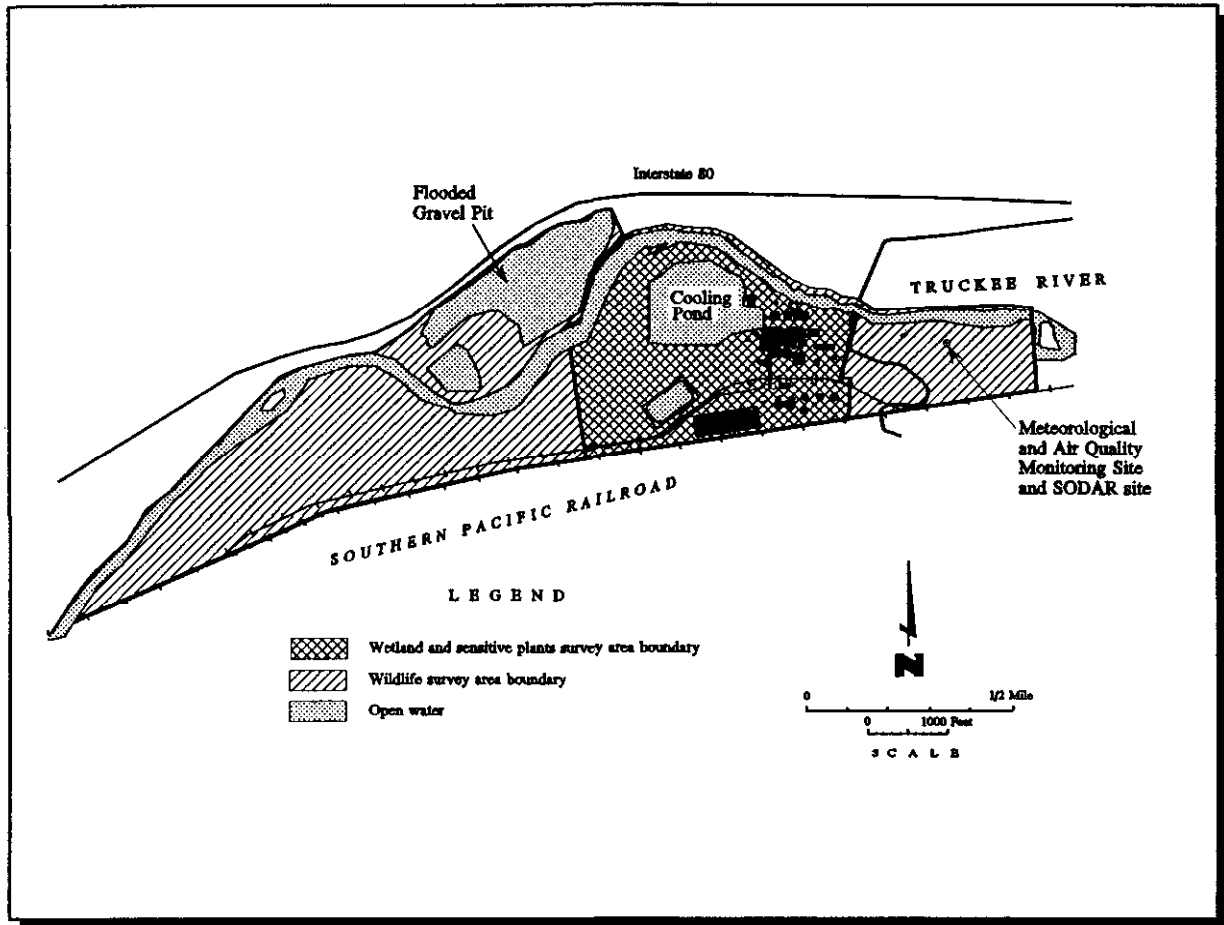


Figure 3.6-1. Biological survey areas.

The upland vegetation communities delineated in the survey area are various successional stages of desert shrub communities dominated either by big sagebrush or co-dominated by greasewood and saltbrush. These communities range from pure stands of mature sage to mixtures of greasewood and saltbrush with no sage, to various combinations of big sagebrush and other shrub species such as saltbrush, rabbitbrush, greasewood and hop sage. In areas where upland vegetation is present, the mean height of the shrub overstory ranges from 0.6 to 3 meters (2 to 10 feet) and shrub canopy cover ranges from 10 to 80 percent.

Common shrubs within the survey area include big sagebrush, rabbitbrush, and hop sage (*Grayia spinosa*), greasewood (*Sarcobatus vermiculatus*), and saltbrush (*Atriplex canescens*). Herbaceous species identified within the desert shrub community include fiddleneck (*Amsinckia tessellata*), delicate gilia

Table 3.6-1. Acreage of habitat types within the survey area (Ebasco, 1993i).

Habitat Type	Acreage	Percent of Total
<u>Open water:</u>		
Truckee River	49.6	9.1
Abandoned gravel mine ponds	40.1	7.4
Cooling pond & make-up station pond	31.8	5.8
Evaporation pond	4.5	0.8
Subtotal:	126.0	23.1
Riparian woodland and wetlands	21.6	4.0
<u>Big sagebrush desert shrub:</u>		
Big sagebrush	4.1	0.8
Big sagebrush/rabbitbrush	6.4	1.2
Big sagebrush/saltbrush/rabbitbrush/hop sage	72.6	13.3
Subtotal:	83.1	15.2
<u>Greasewood desert shrub:</u>		
Greasewood/saltbrush	18.4	3.4
Greasewood/saltbrush/big sagebrush/rabbitbrush	33.1	6.1
Subtotal:	51.5	9.4
<u>Highly disturbed:</u>		
Tracy Station & surrounding facilities	74.9	13.7
Active mining operation	45.4	8.3
Recently abandoned mining operation	34.0	6.2
Abandoned gravel mining operation	18.6	3.4
Subtotal:	172.9	31.7
Disturbed big sagebrush desert shrub	90.4	16.6
Total:	545.5	100.0

(*Gilia tenerrima*), whitestem stickleaf (*Mentzelia albicaulis*), purple mat (*Nama aretioides*), two species of phacelia (*Phacelia crenulata* and *P. lutea*), desert mallow (*Sphaeralcea ambigua*), and tumbling mustard (*Sisymbrium altissimum*). Grasses also contribute to the species constituting the herbaceous layer

of the desert shrub community. Representative grass species include cheatgrass (*Bromus tectorum*), bunch grass (*Elymus glaucus*), creeping wildrye (*Elymus triticoides*), foxtail (*Hordeum jubatum*), and Indian ricegrass (*Oryzopsis hymenoides*). Fremont's cottonwood also occurs within the survey area, primarily along the Truckee River, but also in a dwarf, stressed state in dredge spoils from construction of the Tracy cooling pond. Additional species observed during the May and July 1993 site visits are listed in Table 3.6-2. It should be noted that over time the vegetation in this region has changed substantially because of fires that took place during early settlements. Many ecologists believe that the sagebrush/grass plant communities once had considerably more palatable perennial grass species; but these grasses have been replaced with less desirable species. Fire, and the introduction of invader species (e.g., cheatgrass or bronco grass (*Bromus tectorum*)), have resulted in permanent changes (Tueller, 1989).

The usual array of wildlife found in western Nevada exists within Storey County's interior; specifically, a wide variety of wildlife species typical of the northern desert shrub/salt desert shrub community occur in the survey area (see Table 3.6-3). To protect wildlife, the state Fish and Game Commission has recommended that a wildlife management area be established to cover the county (Storey County, 1993). However, personal communication with Roy Leach, Habitat Chief for Region II of the Nevada Division of Wildlife (NDOW) indicated that currently there is no plan nor budgeted funds to purchase the Federal lands necessary to establish such a wildlife management area.

Wildlife surveys were conducted during March, May, June, and October, 1993, in an area that extended from the railroad tracks bordering the southern edge of the site to the Truckee River on the northern border, and approximately 0.8 km (0.5 mile) east of the Tracy Power Station, to 2.3 km (1.4 miles) west of the western edge of the cooling pond where the Southern Pacific Railroad crosses the Truckee River. Additional bird observations were made north of the Truckee River, particularly in the large, flooded gravel pit northwest of the site.

Mule deer, pronghorn (*Antilocapra americana*), and wild burros (*Equis asinus*) occur in the project vicinity (see Table 3.6-4). A residual pronghorn population exists to the northwest of the survey area (SPPCo., 1984), but pronghorn have not been documented on site (Ebasco, 1993i). Cattle grazing has also occurred on site as recently as a few years ago (personal communication, Eugene Wiedenbeck, Maintenance Superintendent, SPPCo., March 22, 1993, as cited in Ebasco, 1993i).

Several carnivore species also have been documented in the project vicinity, including the mountain lion (*Felis concolor*), coyote (*Canis latrans*), badger (*Taxidea taxus*), bobcat (*Felis rufus*),

Table 3.6-2. Plant species observed during the May and July 1993 surveys.

Scientific Name	Common Name
<i>Abronia turbinata</i>	transmontane sand verben
<i>Agropyron cristatum</i>	crested wheatgrass
<i>Amsinckia tessellata</i>	fiddleneck
<i>Artemesia tridentata</i>	big sagebrush
<i>Atriplex canescens</i>	saltbrush
<i>Atriplex confertifolia</i>	shadscale
<i>Brickellia californica</i>	bricklebrush
<i>Bromus tectorum</i>	cheatgrass
<i>Camissonia palmeri</i>	Palmer's primrose
<i>Carex spp.</i>	sedge
<i>Chrysothamnus nauseosus</i>	rabbitbrush
<i>Chrysothamnus viscidiflorus</i>	little green rabbitbrush
<i>Cleome lutea</i>	yellow cleome
<i>Cryptantha circumscissa</i>	cushion cryptantha
<i>Cymopteris ibapensis</i>	no common name
<i>Descurania sophia</i>	flixweed
<i>Distichlis spicata</i>	inland saltgrass
<i>Elymus glaucus</i>	bunch grass
<i>Elymus triticoides</i>	creeping wildrye
<i>Eriogonum maculatum</i>	buckwheat; no common name
<i>Eriogonum nidularium</i>	buckwheat; no common name
<i>Eriogonum vimineum</i>	wicker buckwheat
<i>Erodium cicutarium</i>	storksbill
<i>Gilia tenerrima</i>	delicate gilia
<i>Gnaphalium palustre</i>	western marsh cudweed
<i>Grayia spinosa</i>	hop sage
<i>Halogeton glomeratus</i>	no common name
<i>Happlopappus bloomeri</i>	goldenweed
<i>Hordueum jubatum</i>	foxtail
<i>Juncus balticus</i>	baltic rush
<i>Juncus bufonius</i>	toad rush
<i>Layia glandulosa</i>	white layia
<i>Lepidium latifolium</i>	broadleaf peppergrass
<i>Marina parryi</i>	no common name
<i>Mentha spicata</i>	penny royal
<i>Mentzelia albicaulis</i>	whitestem stickleaf
<i>Nama aretioides</i>	purple mat
<i>Oryzopsis hymenoides</i>	Indian ricegrass
<i>Phacelia crenulata</i>	heliotrope phacelia

Table 3.6-2. Plant species observed during the May and July 1993 surveys (continued).

Scientific Name	Common Name
<i>Phacelia lutea</i>	heliotrope
<i>Phlox caespitosa</i>	phlox
<i>Polypogon monosplensis</i>	annual rabbit-foot grass
<i>Populus fremontii</i>	Fremont's cottonwood
<i>Salix boothii</i>	Booth's willow
<i>Salix exigua</i>	sandbar willow
<i>Salix lasiandra</i>	Pacific willow
<i>Salsola kali</i>	Russian thistle
<i>Salsola paulsenii</i>	tumbleweed
<i>Sarcobatus vermiculatus</i>	greasewood
<i>Sisymbrium altissimum</i>	tumbling mustard
<i>Sitanion hystrix</i>	squirreltail
<i>Sphaeralcea ambigua</i>	desert mallow
<i>Stephanomeria pauciflora</i>	few-flowered wire lettuce
<i>Tetradymia canescens</i>	horsebrush
<i>Tiquilia nuttallii</i>	no common name
<i>Tribulus terrestris</i>	puncture vine
<i>Typha sp.</i>	cattails
<i>Verbascum thapsus</i>	wooly mullein

raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), western spotted skunk (*Spilogale gracilis*), long-tailed weasel (*Mustela frenata*), mink (*Mustela vison*), and river otter (*Lutra canadensis*) (SPPCo., 1984; 1993d; JBR, 1993). Coyote and bobcat tracks were observed during 1993 wildlife surveys.

Rodents are the most well represented mammal order in the project vicinity. The muskrat (*Ondatra zibethicus*), Merriam's kangaroo rat (*Dipodomys merriami*), Great Basin pocket mouse (*Perognathus parvus*), California ground squirrel (*Spermophilus beecheyi*), and antelope ground squirrel (*Ammospermophilus leucurus*) previously have been reported in the project vicinity (SPPCo., 1984; JBR, 1993). Additionally, beaver (*Castor canadensis*) were observed during the spring 1993 wildlife surveys. Eighteen individuals of five species of small mammals were trapped in the survey area in 1993, and include eight desert woodrats (*Neotoma lepida*), five deer mice (*Peromyscus maniculatus*), three bushy-tailed woodrats (*N. cinerea*), one Merriam's kangaroo rat, and one Great Basin pocket mouse.

Table 3.6-3. Wildlife species observed at the Tracy Power Station and surrounding region.

Species				
	Common Name	Scientific Name	Location	Source
Birds:	Double-crested cormorant	<i>Phalacrocorax auritus</i>	regional	USFWS, 1993a
	Great blue heron	<i>Ardea herodias</i>	site	SPPCo., 1993d; USFWS, 1993a
	Black-crowned night heron	<i>Nycticorax nycticorax</i>	site	SPPCo., 1993d; USFWS, 1993a
	Canada goose	<i>Branta canadensis</i>	regional	USFWS, 1993a
	Wood duck	<i>Aix sponsa</i>	regional	USFWS, 1993a
	Mallard	<i>Anas platyrhynchos</i>	regional	USFWS, 1993a
	Cinnamon teal	<i>Anas cyanoptera</i>	regional	USFWS, 1993a
	Gadwall	<i>Anas strepera</i>	regional	USFWS, 1993a
	Bufflehead	<i>Bucephala albeola</i>	regional	USFWS, 1993a
	Common merganser	<i>Mergus merganser</i>	regional	USFWS, 1993a
	Ruddy duck	<i>Oxyura jamaicensis</i>	regional	USFWS, 1993a
	Turkey vulture	<i>Cathartes aura</i>	site	SEA, 1975; SPPCo. 1984
	Osprey	<i>Pandion haliaetus</i>	regional	SEA, 1974; JBR 1993
	Bald eagle	<i>Haliaeetus leucocephalus</i>	regional	JBR, 1993
	Red-tailed hawk	<i>Buteo jamaicensis</i>	site	SEA, 1975; SPPCo. 1984, 1993d; USFWS, 1993a
	Golden eagle	<i>Aquila chrysaetos</i>	site	SEA, 1975; SPPCo. 1984
	American kestrel	<i>Falco sparverius</i>	site	SPPCo., 1984; USFWS, 1993a
	California quail	<i>Callipepla californica</i>	regional	USFWS, 1993a
	American coot	<i>Fulica americana</i>	regional	USFWS, 1993a
	Killdeer	<i>Charadrius vociferus</i>	regional	USFWS, 1993a
	Spotted sandpiper	<i>Actitis macularia</i>	regional	USFWS, 1993a
	California gull	<i>Larus californicus</i>	site	SPPCo., 1993d
	Rock dove	<i>Colomba livia</i>	regional	USFWS, 1993a
	Mourning dove	<i>Zenaida macroura</i>	regional	USFWS, 1993a
	Great horned owl	<i>Bubo virginianus</i>	regional	JBR, 1993
	Common nighthawk	<i>Chordeiles minor</i>	regional	USFWS, 1993a
	Belted kingfisher	<i>Ceryle alcyon</i>	regional	USFWS, 1993a
	Downy woodpecker	<i>Picoides pubescens</i>	regional	USFWS, 1993a
	Northern flicker	<i>Colaptes auratus</i>	regional	USFWS, 1993a
	Western wood-pewee	<i>Contopus sordidulus</i>	regional	USFWS, 1993a
	Western kingbird	<i>Tyrannus verticalis</i>	regional	USFWS, 1993a
	Tree swallow	<i>Tachycineta bicolor</i>	regional	USFWS, 1993a
	Violet-green swallow	<i>Tachycineta thalassina</i>	regional	USFWS, 1993a
	Northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>	regional	USFWS, 1993a
	Bank swallow	<i>Riparia riparia</i>	regional	USFWS, 1993a
	Cliff swallow	<i>Hirundo pyrrhonota</i>	regional	USFWS, 1993a
	Barn swallow	<i>Hirundo rustica</i>	regional	USFWS, 1993a
	Black-billed magpie	<i>Pica pica</i>	regional	USFWS, 1993

Table 3.6-3. Wildlife species observed at the Tracy Power Station and surrounding region (continued).

Species				
	Common Name	Scientific Name	Location	Source
	Bushtit	<i>Psaltirparus minimus</i>	regional	USFWS, 1993a
	Rock wren	<i>Salpinctes obsoletus</i>	site	SPPCo., 1984; USFWS, 1993a
	Bewick's wren	<i>Thryomanes bewickii</i>	site	SPPCo., 1984; USFWS, 1993a
	House wren	<i>Troglodytes aedon</i>	site	SPPCo., 1984; USFWS, 1993a
	Marsh wren	<i>Cistothorus palustris</i>	regional	USFWS, 1993a
	American robin	<i>Turdus migratorius</i>	regional	USFWS, 1993a
	Loggerhead shrike	<i>Lanius ludovicianus</i>	regional	JBR, 1993
	European starling	<i>Sturnus vulgaris</i>	regional	USFWS, 1993a
	Warbling vireo	<i>Vireo gilvus</i>	regional	USFWS, 1993a
	Orange-crowned warbler	<i>Vermivora celata</i>	regional	USFWS, 1993a
	Yellow warbler	<i>Dendroica petechia</i>	regional	USFWS, 1993a
	Yellow-rumped warbler	<i>Dendroica coronata</i>	regional	USFWS, 1993a
	MacGillivray's warbler	<i>Oporonis tolmiei</i>	regional	USFWS, 1993a
	Western tanager	<i>Piranga ludoviciana</i>	regional	USFWS, 1993a
	Black-headed grosbeak	<i>Pheucticus melanocephalus</i>	regional	USFWS, 1993a
	Lazuli bunting	<i>Passerina amoena</i>	regional	USFWS, 1993a
	Chipping sparrow	<i>Spizella passerina</i>	regional	USFWS, 1993a
	Brewer's sparrow	<i>Spizella breweri</i>	regional	USFWS, 1993a
	Sage sparrow	<i>Amphispiza belli</i>	site	SPPCo., 1984; 1993d
	Black-throated sparrow	<i>Amphispiza bilineata</i>	regional	USFWS, 1993a
	White-crowned sparrow	<i>Zonotrichia leucophrys</i>	site	SPPCo., 1993d; USFWS, 1993a
	Song sparrow	<i>Melospiza melodia</i>	regional	USFWS, 1993a
	Red-winged blackbird	<i>Agelaius phoeniceus</i>	regional	USFWS, 1993a
	Yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>	regional	USFWS, 1993a
	Brewer's blackbird	<i>Euphagus cyanocephalus</i>	regional	USFWS, 1993a
	Brown-headed cowbird	<i>Molothrus ater</i>	regional	USFWS, 1993a
	Northern oriole	<i>Icterus galbula</i>	regional	USFWS, 1993a
	House finch	<i>Carpodacus mexicanus</i>	regional	USFWS, 1993a
Mammals:	Desert cottontail	<i>Sylvilagus audubonii</i>	site	SPPCo., 1993d
	Black-tailed jackrabbit	<i>Lepus californicus</i>	site	SPPCo., 1993d
	White-tailed antelope squirrel	<i>Ammospermophilus leucurus</i>	regional	SPPCo., 1984
	California ground squirrel	<i>Spermophilus beecheyi</i>	regional	SPPCo., 1984
	Great Basin pocket mouse	<i>Perognathus parvus</i>	regional	SPPCo., 1984
	Merriam's kangaroo rat	<i>Dipodomys merriami</i>	regional	SPPCo., 1984

Table 3.6-3. Wildlife species observed at the Tracy Power Station and surrounding region (continued).

Species				
	Common Name	Scientific Name	Location	Source
	Muskrat	<i>Ondatra zibethicus</i>	regional	JBR, 1993
	Coyote	<i>Canis latrans</i>	regional	SPPCo., 1984
	Raccoon	<i>Procyon lotor</i>	site	SPPCo., 1993d
	Long-tailed weasel	<i>Mustela frenata</i>	regional	JBR, 1993
	Mink	<i>Mustela vison</i>	regional	JBR, 1993
	Badger	<i>Taxidea taxus</i>	regional	SPPCo., 1984
	Western spotted skunk	<i>Spilogale gracilis</i>	regional	JBR, 1993
	Striped skunk	<i>Mephitis mephitis</i>	regional	JBR, 1993
	River otter	<i>Lutra canadensis</i>	regional	JBR, 1993
	Mountain lion	<i>Felis concolor</i>	regional	JBR, 1993
	Bobcat	<i>Felis rufus</i>	regional	SPPCo., 1984
	Mule deer	<i>Odocoileus hemionus</i>	site	SPPCo., 1984; 1993d
	Pronghorn	<i>Antilocarpa americana</i>	regional	SPPCo., 1984
Amphibians:	Bullfrog	<i>Rana catesbiana</i>	regional	SPPCo., 1984
Reptiles:	Desert collared lizard	<i>Crotaphytus insularis</i>	site	SPPCo., 1984
	Desert spiny lizard	<i>Sceloporus magister</i>	site	SPPCo., 1984
	Gopher snake	<i>Pituophis melanoleucus</i>	regional	SPPCo., 1984
	Western rattlesnake	<i>Crotalus viridis</i>	regional	SPPCo., 1984
Fish:	<u>Cooling Pond</u>			
	Carp	<i>Cyprinus carpio</i>	site	SPPCo., 1993d; this study
	Channel catfish	<i>Ictalurus punctatus</i>	site	SPPCo., 1993d; this study
	Green sunfish	<i>Lepomis cyanellus</i>	site	SPPCo., 1993d; this study
	Largemouth bass	<i>Micropterus salmoides</i>	site	SPPCo., 1993d; this study
	Mosquito fish	<i>Gambusia affinis</i>	site	This study
	<u>Truckee River</u>			
	Rainbow trout	<i>Oncorhynchus mykiss</i>	regional	SPPCo., 1993d; NDOW 1989; 1990; 1991; 1992
	Brown trout	<i>Salmo trutta</i>	regional	SPPCo., 1993d; NDOW 1989; 1990; 1991; 1992
	Carp	<i>Cyprinus carpio</i>	regional	SPPCo., 1993d
	Tahoe sucker	<i>Catostomas tahoensis</i>	regional	SPPCo., 1993d; NDOW 1989; 1990; 1991; 1992
	Green sunfish	<i>Lepomis cyanellus</i>	regional	SPPCo., 1993d
	Redside shiner	<i>Richardsonius egregius</i>	site	NDOW 1989; 1990; 1991; 1992
	Lahontan sucker	<i>Catostomus platyrhynchus</i>	site	NDOW 1989; 1990; 1991; 1992
	Speckled dace	<i>Rhinichthys osculus</i>	site	NDOW 1989; 1990; 1991; 1992
	Mosquito fish	<i>Gambusia affinis</i>	site	NDOW 1989; 1990; 1991; 1992

Table 3.6-4. Wildlife species observed in the survey area during the March, May, June, and October 1993 surveys.

	Common Name	Scientific Name
Birds:	Western grebe	<i>Aechmophorus occidentalis</i>
	Eared grebe	<i>Podiceps caspicus</i>
	Pied-billed grebe	<i>Podilymbus podiceps</i>
	White pelican	<i>Pelecanus erythrorhynchos</i>
	Double-crested cormorant	<i>Phalacrocorax auritus</i>
	Great blue heron	<i>Ardea herodias</i>
	Black-crowned night heron	<i>Nycticorax nycticorax</i>
	Canada goose	<i>Branta canadensis</i>
	Mallard	<i>Anas platyrhynchos</i>
	Gadwall	<i>Anas strepera</i>
	Cinnamon teal	<i>Anas cyanoptera</i>
	Canvasback	<i>Aythya valisineria</i>
	Lesser scaup	<i>Aythya affinis</i>
	Bufflehead	<i>Bucephala albeola</i>
	Common merganser	<i>Mergus merganser</i>
	Ruddy duck	<i>Oxyura jamaicensis</i>
	Turkey vulture	<i>Cathartes aura</i>
	Red-tailed hawk	<i>Buteo jamaicensis</i>
	Northern harrier	<i>Circus cyaneus</i>
	American kestrel	<i>Falco sparverius</i>
	California quail	<i>Callipepla californica</i>
	American coot	<i>Fulica americana</i>
	Killdeer	<i>Charadrius vociferus</i>
	California gull	<i>Larus californicus</i>
	Rock dove	<i>Columba livia</i>
	Mourning dove	<i>Zenaida macroura</i>
	Great horned owl	<i>Bubo virginianus</i>
	Lesser nighthawk	<i>Chordeiles acutipennis</i>
	Hairy woodpecker	<i>Picoides villosus</i>
	Northern flicker	<i>Colaptes auratus</i>
	Western kingbird	<i>Tyrannus verticalis</i>
	N. rough-winged swallow	<i>Stelgidopteryx serripennis</i>
	Barn swallow	<i>Hirundo rustica</i>
	Cliff swallow	<i>Hirundo pyrrhonota</i>
	Black-billed magpie	<i>Pica pica</i>
	American crow	<i>Corvus brachyrhynchos</i>
	House wren	<i>Troglodytes aedon</i>
	American robin	<i>Turdus migratorius</i>
	European starling	<i>Sturnus vulgaris</i>
	Yellow-rumped warbler	<i>Dendroica coronata</i>

Table 3.6-4. Wildlife species observed in the survey area during the March, May, June, and October 1993 surveys (continued).

	Common Name	Scientific Name
	Lazuli bunting	<i>Passerina amoena</i>
	Black-throated sparrow	<i>Amphispiza bilineata</i>
	White-crowned sparrow	<i>Zonotrichia leucophrys</i>
	Song sparrow	<i>Melospiza melodia</i>
	Red-winged blackbird	<i>Agelaius phoeniceus</i>
	Western meadowlark	<i>Sturnella neglecta</i>
	Brewer's blackbird	<i>Euphagus cyanocephalus</i>
	Brown-headed cowbird	<i>Molothrus ater</i>
	Northern (Bullock's) oriole	<i>Icterus galbula</i>
	House finch	<i>Carpodacus mexicanus</i>
	Dark-eyed junco	<i>Junco hyemalis</i>
Mammals:	Desert cottontail	<i>Sylvilagus auduboni</i>
	Black-tailed jackrabbit	<i>Lepus californicus</i>
	White-tailed antelope squirrel	<i>Ammospermophilus leucurus</i>
	California ground squirrel	<i>Citellus beecheyi</i>
	Great basin pocket mouse	<i>Perognathus parvus</i>
	Merriam's kangaroo rat	<i>Dipodomys merriami</i>
	Beaver	<i>Castor canadensis</i>
	Deer mouse	<i>Peromyscus maniculatus</i>
	Desert woodrat	<i>Neotoma lepida</i>
	Bushy-tailed woodrat	<i>Neotoma cinerea</i>
	Muskrat	<i>Ondatra zibethicus</i>
	Coyote [scat & tracks]	<i>Canis latrans</i>
	Bobcat [tracks]	<i>Felis rufus</i>
	Wild burro [bones]	<i>Equus asinus</i>
	Mule deer	<i>Odocoileus hemionus</i>
Reptiles:	Side-blotch lizard	<i>Uta stansburiana</i>
	Western fence lizard	<i>Sceloporus occidentalis</i>
	Desert spiny lizard	<i>Sceloporus magister</i>
	Western whiptail	<i>Cnemidophorus tigris</i>
	Western rattlesnake	<i>Crotalus viridis</i>
Fish:	Carp*	<i>Cyprinus carpio</i>
	Channel catfish*	<i>Ictalurus punctatus</i>
	Largemouth bass*	<i>Micropterus salmoides</i>
	Green sunfish*	<i>Lepomis cyanellus</i>
* NDOW Survey.		

The Truckee River, cooling pond, and associated habitats support a variety of waterbirds, including waterfowl such as ducks and geese, waders such as herons, and other waterbirds including gulls and shorebirds (*SPPCo.*, 1993d). During the spring 1993 wildlife surveys, approximately 100 to 150 ducks were observed in the large flooded gravel pit on the north side of the Truckee River. Ruddy ducks (*Oxyura jamaicensis*) were the most numerous of the duck species, followed by buffleheads (*Bucephala albeola*), common mergansers (*Mergus merganser*), gadwalls (*Anas strepera*), canvasbacks (*Aythya valisineria*), mallards (*Anas platyrhynchos*), and lesser scaups (*Aythya affinis*). Several of these species, as well as cinnamon teal (*Anas cyanoptera*), were observed during the June, July, and October 1993 wildlife surveys.

A few pairs of Canada geese were present in the flooded gravel pit, and approximately 10 to 15 pairs were present in and around the cooling pond during the spring 1993 surveys. During these surveys, egg-laying was ongoing with at least one goose pair using one of the ten 55-gallon drum artificial-nesting platforms located around the cooling pond and along the spit extending into the pond from the east. Pairs of Canada geese also were observed during these surveys along the banks of the Truckee River upstream, downstream, and adjacent to the survey area. The banks and islands along the Truckee River throughout the survey area and the banks and spit of the Tracy cooling pond are used by nesting Canada geese. The only other waterfowl observed on the cooling pond were a pair of mallards.

Waders such as great blue herons (*Ardea herodias*) and black-crowned night herons (*Nycticorax nycticorax*) have been observed on site (*SPPCo.*, 1993d). Both of these species were observed during the 1993 surveys.

Other waterbird species have been documented on the cooling pond and the flooded gravel pit. Approximately 2,000 California gulls and 100 American coots (*Fulica americana*) were observed in the large flooded gravel pit on the north side of the Truckee River during the spring 1993 wildlife surveys. Double-crested cormorants (*Phalacrocorax auritus*) also were observed in this flooded gravel pit. Aside from waterfowl discussed previously, the only other waterbirds observed on the cooling pond were a pair of western grebes (*Aechmophorus occidentalis*) and three double-crested cormorants.

The number of waterfowl present was much lower during the fall surveys and consisted primarily of California gulls and a few resident geese and ducks. Migratory species that nest at the site were gone, and the dominant bird species were large flocks of white crown sparrows and Brewer's blackbirds. No previously unreported species were observed during these surveys.

Several raptor and songbird species occur in the survey area in the northern desert shrub/salt desert shrub and adjacent riparian habitats along the Truckee River. During the spring 1993 surveys, two pairs of American kestrels (*Falco sparverius*), one great horned owl (*Bubo virginianus*), and a red-tailed hawk were observed in the project vicinity. Cavity-nesting birds observed during the 1993 surveys included northern flicker (*Colaptes auratus*) and hairy woodpecker (*Picoides villosus*). A variety of songbirds also were documented in the project vicinity during March, June, July, and October 1993.

Riparian woodland habitats along the Truckee River provide nesting habitat for a variety of songbirds and raptors. Nests of red-tail hawks, American kestrels, northern orioles, and black-billed magpies were observed in riparian woodland habitat during the June 1993 surveys. No nests were observed in other habitat types.

The desert collared lizard (*Crotaphytus insularis*) and desert spiny lizard (*Sceloporus magister*) have been previously documented in the project area, while the western rattlesnake (*Crotalus viridis*), Great Basin gopher snake (*Pituophis melanoleucus*), and bullfrog (*Rana catesbiana*) have been reported in the region (SPPCo., 1984). During the June 1993 surveys, desert spiny lizards, western fence lizards (*Sceloporus occidentalis*), side-blotch lizards (*Uta stansburiana*), and western whiptails (*Cnemidophorus tigris*) were observed. Rattlesnakes have been captured on the site and were observed during the October 1993 wildlife survey (personal communication, Eugene Wiedenbeck, Maintenance Superintendent, SPPCo., March 22, 1993, as cited in Ebasco, 1993i).

The various, yet similar, habitats and the number of species in the immediate vicinity of the proposed site are typical of those found in the rest of the region.

### **3.6.3 Threatened and Endangered Species**

A list of sensitive plant species that could exist in the survey area was developed following consultation with the Nevada Natural Heritage Program (NVNHP), the U.S. Fish and Wildlife Service (USFWS), and the Northern Nevada Native Plant Society (NNNPS). Two species were identified in the Patrick, Chalk Hills, Vista, Wadsworth, and Spanish Springs Peak U.S. Geological Survey quadrangles: Lobb's buckwheat (*Eriogonum robustum*) and Nevada orcytes (*Oryctes nevadensis*). None of the occurrences, however, was located within the survey area.

Table 3.6-5. Rare, threatened, endangered, and sensitive plant species that may occur in the survey area.

Scientific Name	Common Name	Habitat	Flowering Period	State Status	Federal Status	NNNPS * Listing	NVNHP ** Rank
<i>Astragalus lentiginosus</i> var. <i>chartaceus</i>	San Pitch Valley milkvetch	Gravelly, sand bluffs and valley floors	May-June	—	2	D	G5T4S2?
<i>Eriogonum robustum</i>	Lobb's buckwheat	Granitic soils	June-August	—	2	W	G2S2
<i>Opuntia pulchella</i>	sand cholla	Sand dunes and dry lake borders	May-June	CY	3C	D	G4S2S3
<i>Oryctes nevadensis</i>	oryctes	Dry, sandy soils	May-June	—	2	W	G2S2
<i>Polyctenium williamsiae</i>	William's combleaf	Edges of vernal ponds	May-June	CE	1	T	G1S1

**Legend**

\* Northern Nevada Native Plant Society

\*\* Nevada Natural Heritage Program

**State Status**

CE = Critically Endangered

CY = Protected as a Cactus, Yucca or Christmas Tree under NRS 527.060 to 0.120

**Federal Status**

1 = Category 1 Candidate

2 = Category 2 Candidate

3C = Dropped from consideration as a candidate for listing, Taxa (e.g., species, genus) proved to be more abundant or widespread, or less vulnerable, than previously thought

**NNNPS Listing**

T = Threatened

W = Watch, potentially vulnerable taxa in need of monitoring or further data to determine status

D = Deleted from consideration by NNNPS because presently considered secure, taxonomically indistinct, etc.

**NVNHP Rank**

G = Global rank indicator, based on worldwide distribution at the species level

T = Trinomial rank indicator, based on worldwide distribution at the infraspecific level

S = State rank indicator, based on distribution within Nevada, at the lowest taxonomic level

1 = Critically imperiled due to extreme rarity, imminent threats, or biological factors

2 = Imperiled due to rarity or other demonstrable factors

3 = Rare and local throughout its range, or with very restricted range, or otherwise vulnerable to extinction

4 = Apparently secure, though frequently quite rare in parts of its range, especially at its periphery

5 = Demonstrably secure, though frequently quite rare in parts of its range, especially at its periphery

? = Assigned rank uncertain

Sensitive species occurring in Storey, Lyon, and Washoe Counties were considered for potential occurrence within the survey area. An additional 28 species known to occur within these counties were identified (*Morefield and Knight, 1991*). Twenty-five of the species noted, however, were not considered further because specific habitat requirements did not exist in the survey area. It was determined that a total of five sensitive species could potentially occur within the survey area (see Table 3.6-5).

William's combleaf (*Polyctenium williamsiae*) and sand cholla (*Opuntia pulchella*) are known to occur in surrounding counties. William's combleaf is listed as "endangered" in the state of Nevada and is a Category 1 candidate for Federal listing. Category 1 candidates are species for which the USFWS has on file substantial information on biological vulnerability to support the appropriateness of a proposal for listing. Sand cholla is a "protected" species in the state of Nevada but is considered too widespread to be considered for Federal listing (Federal status 3C). Lobb's buckwheat, orytes, and San Pitch Valley milkvetch (*Astragalus lentiginosus* var. *chartaceus*) are Category 2 candidates for Federal listing and hold no state status. Field botanists searched the survey area for sensitive species during the period of May 5 to May 7, 1993 and again on July 1, 1993. These times correspond to the blooming periods for all of the sensitive species. No sensitive species was found within the survey area (see also the Technical Report on Biological Resources, available in the reading rooms listed in Appendix H).

A total of 11 sensitive fish and wildlife species were identified (see Table 3.6-6). The bald eagle (*Haliaeetus leucocephalus*) and Cui-ui are federally endangered, and the Lahontan cutthroat trout is federally threatened. The remaining eight species are candidates for Federal listing with Category 2 status. Category 2 species may warrant listing as threatened or endangered, but the biological information required to support a proposal for listing is lacking. Information regarding sensitive fish and wildlife species that potentially could exist in the survey area was compiled through a literature review and agency communications. Initial data indicated that observations of sensitive fish and wildlife species at the Tracy Power Station were unlikely. However, searches for sensitive fish and wildlife species were included as part of fisheries and wildlife surveys, which were conducted during the periods of March 22-23, 1993; May 5-7, 1993; June 29-30, 1993; and October 7-8, 1993. No sensitive fish or wildlife species were observed.

The Cui-ui is an endangered species of sucker, restricted to Pyramid Lake and the lower 51 km (32 miles) of the Truckee River since construction of Derby Dam in 1906 (see Figure 3.6-2). Pyramid Lake provides rearing habitat for larvae, juveniles, and adult Cui-ui. Adult Cui-ui migrate up the Truckee River to spawn in the spring (April and May). The spawning run generally lasts for a 4 to 8 week period, with the majority of fish entering the river during a 1- to 2-week period, usually concluding

**Table 3.6-6. Rare, threatened, endangered, and sensitive fish and wildlife species that may occur in the survey area.**

Scientific Name	Common Name	Federal Status
<b>Birds</b>		
<i>Haliaeetus leucocephalus</i>	Bald eagle	Endangered
<i>Chlidonias niger</i>	Black tern	Category 2 Candidate*
<i>Ixobrychus exilis hesperia</i>	Western least bittern	Category 2 Candidate*
<i>Lanius ludovicianus</i>	Loggerhead shrike	Category 2 Candidate*
<i>Plegadis chihi</i>	White-faced ibis	Category 2 Candidate*
<b>Mammals</b>		
<i>Brachylagus idahoensis</i>	Pygmy rabbit	Category 2 Candidate*
<i>Euderma maculatum</i>	Spotted bat	Category 2 Candidate*
<b>Reptiles</b>		
<i>Clemmys marmorata marmorata</i>	Northwestern pond turtle	Category 2 Candidate*
<b>Invertebrates</b>		
<i>Anodonta californiensis</i>	California floater	Category 2 Candidate*
<b>Fish</b>		
<i>Chasmistes cujus</i>	Cui-ui	Endangered
<i>Oncorhynchus clarki henshawi</i>	Lahontan cutthroat trout	Threatened
* Taxa for which existing biological information indicates may warrant listing as a threatened or endangered species, but for which substantial biological information to support a proposed rule is lacking.		

the run in early June; however, spawning runs may occur as late as June. Spawning generally takes place within the lower 16 km (10 miles) of the river; most Cui-ui spawn between Marble Bluff Dam (located near the Truckee River confluence with Pyramid Lake) and Numana Dam, where the fish ladder is not conducive to Cui-ui passage.

During spawning, eggs are spread in an area that averages 50 square meters (538 square feet) in size. The preferred spawning substrate is predominantly gravel, in water depths of 0.24 to 1.22 meters (0.8 to 4.0 feet) with velocities of 0.31 to 0.61 meters/second (1 to 2 feet/second). Fertilized eggs hatch in 1 to 2 weeks, depending on water temperature. The optimum temperature range is 14.4°C to 17.2°C (58° to 63°F) (*Scoppetonne et al, 1983, as cited in USFWS, 1992*).

Maintenance of Pyramid Lake's surface elevation and the Truckee River's flow is critical to fish passage over the Truckee River delta. The minimum lake elevation required for passage through the Pyramid Lake Fishway is 1,153 meters

(3,784 feet) above mean sea level (msl). Lake elevations between 1,153 and 1,162 meters (3,784 and 3,812 feet) msl allow passage through the Marble Bluff Fishway; when lake elevation reaches 1,162 meters (3,812 feet) msl, passage across the Truckee River delta is possible. The Cui-ui also require 210 cfs or approximately 150,000 acre-feet/year of flow for spawning and return to Pyramid Lake (*USFWS, 1992*).

A variety of factors, including increased temperatures and sediment loading, decreased dissolved oxygen, and point and nonpoint source pollutants, have adversely affected Cui-ui spawning and nursery areas. Discharge from the Truckee River into Pyramid Lake frequently has been insufficient to allow spawning activities. Sediment loads have created an extensive delta at the river mouth, which often is a barrier preventing Cui-ui from moving upstream (*USFWS, 1992*). Numana Dam (approximately 16 km (10 miles) upstream of Pyramid Lake) and Derby Dam (approximately 51 km (32 miles) upstream) further restrict upstream migration of Cui-ui (*USFWS, 1992, as cited in Ebasco, 1993i*). Derby Dam, constructed by the U.S. Bureau of Reclamation in 1906 as part of the Newlands agricultural project, diverts a portion (usually less than 20 percent but historically as much as 50 percent) of the Truckee

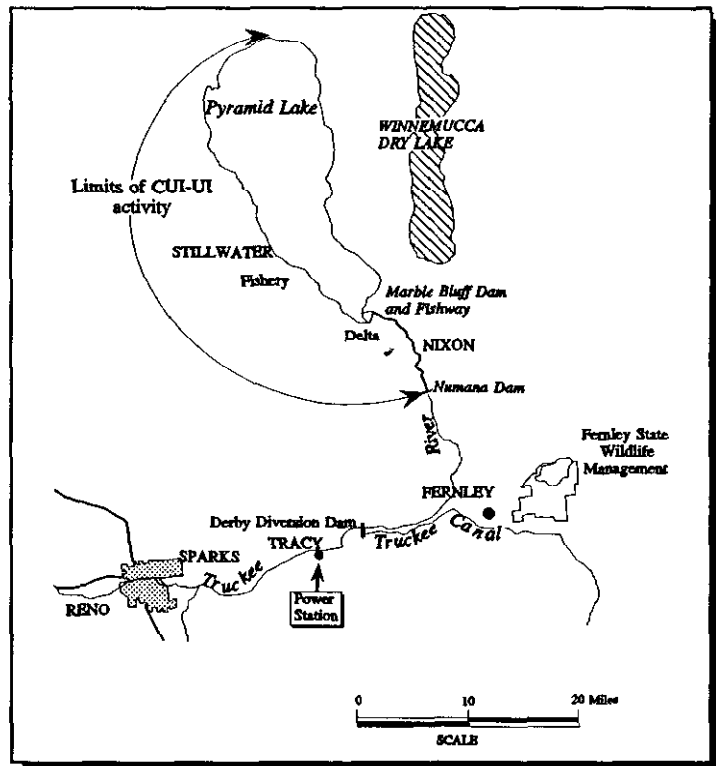


Figure 3.6-2. Cui-ui activity area.

River's flow to the Truckee Canal and Lahontan Reservoir. The reclamation project's diversion of water from the Truckee River-Pyramid Lake System to the Carson River Basin caused Pyramid Lake's level to lower and a delta to form at the mouth of the Truckee River.

The current Cui-ui population is projected to be approximately 1.1 million (*USFWS, September 10, 1993 news release*). A Cui-ui spawning run of 17,800 fish occurred in the spring of 1993. However, the 1993 spawning run (considered to be average in size and the first since 1987) was severely depleted by fish passage problems (fishway and fish elevator) and predation from American white pelicans.

The Cui-ui Recovery Plan was originally approved by the USFWS in 1978. The second revision of the recovery plan, *prepared by an interdisciplinary team of representatives from the U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, Nevada Division of Environmental Protection, Nevada Division of Wildlife, Arizona State University, University of Nevada-Reno, and Pyramid Lake Fisheries* (May 15, 1992), currently is in force. Recovery is aimed at increasing spawning flows, decreasing water temperature, improving water quality, and providing a more suitable habitat. The recovery plan calls for a minimum amount of water inflow (or equivalent benefit) of 110,000 acre-feet over the next 25 years, requiring a minimum annual increase of 5,000 acre-feet per year (7 cfs) in order for reclassification to occur.

Measures to implement Cui-ui conservation are ongoing. The Truckee-Carson-Pyramid Lake Settlement Act of 1990 provides the possibility of resolving many long-standing disputes over apportionment of water from the Truckee and Carson Rivers and for promoting efficient use of these waters. The USFWS is currently conducting an 8-year population dynamics study (to be completed in late 1996) to improve the accuracy of Cui-ui population estimates and to assess annual survival rates at each life stage. The Pyramid Lake Paiute Indian Tribe has contracted with the Limnological Research Group at the University of California, Davis, for a multiyear study of potential effects of nutrient loading on Pyramid Lake. The USFWS will continue to operate the Marble Bluff Fish Facility and develop annual plans for the effective use of the Stampede Reservoir to store water for Cui-ui and Lahontan cutthroat trout spawning. The Pyramid Lake Paiute Indian Tribe will continue to operate and maintain the David Koch Cui-ui Hatchery (*USFWS, 1992*).

Increasing competition for the limited water resources of the Truckee and Carson River basins will require changes in traditional surface water management. With the assistance of other agencies and

public and private interests, the Truckee-Carson Hydrologic Model was developed, and the U.S. Bureau of Reclamation is using it to simulate the effects of various water management plans on reservoir storage, instream flows, and diversions at various points along the rivers. A separate subroutine has been incorporated into the model for evaluating impacts on Cui-ui. This includes developing procedures to maximize releases of water stored in the Stampede Reservoir to support Cui-ui recovery. This subroutine utilizes hydrologic data, biological characteristics, and population dynamics of Cui-ui to simulate the response of populations to varying instream flows and Pyramid Lake elevations (*Buchanan and Strekal, 1988*). More information on the Cui-ui can be found in sections 4.1.6.3 and 4.1.7.2 of the environmental consequences chapter of this document and in the Biological Assessment for Cui-ui, Lahontan Cutthroat Trout, and Bald Eagle, which is available in the reading rooms listed in Appendix H.

The Lahontan cutthroat trout is a threatened subspecies of trout that inhabits Pyramid Lake, Independence Lake, and a number of tributary streams in the Truckee River basin, upstream of the project. Lake dwelling (lacustrine) populations migrate upstream to spawn in the spring or early summer (May through July). Physical barriers (such as Numana Dam and Derby Dam) and low water conditions currently prevent Lahontan cutthroat trout from migrating up the Truckee River from Pyramid Lake to the project area (*USFWS, 1993b, as cited in Ebasco, 1993i*).

The federally endangered bald eagle may occur along the Truckee River on a year-round basis; a single adult bird has regularly wintered in the area (*JBR, 1993; USFWS, 1993c*). Mature bald eagles have been observed wintering at the Tracy cooling pond over the past 5 years (*NDOW, 1993*). The Tracy cooling pond provides important open water habitat for these birds throughout the winter (*personal communication, Steve Siegel, SPPCo., Reno, NV, July 20, 1993, as cited in Ebasco, 1993i*).

Efforts to protect the bald eagle's wintering habitat involve the management of perching, roosting, and foraging areas. Important elements of perching sites include tree height, strong lateral branches, proximity to water, and visual access to adjacent habitats. Wintering bald eagles prefer cottonwoods and tree limbs that protrude from waterbodies for perching. While conifers provide the most ideal roosting habitat, bald eagles frequently use old-growth deciduous trees for roosting in riparian areas. Bald eagles wintering in the vicinity of the Tracy Power Station use cottonwood trees along the Truckee River for night roosting and perching (*NDOW, 1993*). Scattered cottonwoods occur on both banks throughout most of the survey area. Bald eagles are opportunistic foragers that feed on a variety of prey items (*Stalmaster et al., 1985*); those wintering along the Truckee River in the vicinity of the Tracy Power Station feed

primarily on migratory fish and waterfowl (*letter from NDOW dated May 15, 1993, as cited in Ebasco, 1993i*).

While none of the Category 2 candidate species listed in Table 3.6-6 were documented during the 1993 biological surveys, potentially suitable habitats for these species are present within the study area. Big sagebrush desert shrub is suitable for the pygmy rabbit and loggerhead shrike, and the spotted bat occurs in desert habitats (*Zeiner et al., 1990a; 1990b*). The Truckee River and associated riparian and wetland habitats, provide suitable habitat for black tern, western least bittern, white-faced ibis, northwestern pond turtle, and California floater.

### 3.6.4 Biodiversity

Biodiversity is the variety of species, communities, gene pools, ecosystems, and ecological functions. It includes the sum total of all the plants, animals, fungi, and microorganisms in an area, all of their individual variances, and all of the interactions between them. The basic unit of biodiversity is the species. Species make up ecosystems and communities and these aggregations of living organisms also are considered within the concept of biodiversity. One way of measuring biological richness is to enumerate the species in an area. However, there are other components of biodiversity that should be considered, such as genera and family diversity, community diversity, and ecosystem diversity. All of Nevada's land area that is not developed, used for transportation and other rights-of-way, or used for agriculture, is rangeland. However, there is considerable variety within the state. The Soil Conservation Service has described approximately 450 unique ecological sites in Nevada; geological and erosional processes have created innumerable distinct environments (*Tueller, 1989*). As a site dominated by salt desert vegetation, the proposed project area falls within one of the major categories of vegetation types in Nevada, which is characterized by subtle differences between sites because of elevation differences and changes in substrate or drainage. In addition, the introduction of invader species (e.g., cheatgrass) and the fact that past disturbances have resulted in no endemic species for the area, add to its uniqueness. However, although the site contributes to the biodiversity of the region, the extent of the diversity within the site, both in vegetation and wildlife, is not great.

## 3.7 Cultural Resources

Cultural resource investigations are mandated under various historic preservation legislation instruments, including the National Historic Preservation Act of 1966 (Pub. L. 89-665), the

Archaeological and Historic Preservation Act of 1969 (Pub. L. 91-700), and the Advisory Council on Historic Preservation's "Procedures for the Protection of Historic and Cultural Properties" (36 CFR Part 80, 36 CFR Part 60, 36 CFR Part 63, 36 CFR Part 66, and 36 CFR Part 800). Investigations conducted under these laws and regulations are loosely referred to as the Section 106 process. Cultural resource research is also mandated by NEPA guidelines.

Following is a discussion of archaeological, Native American cultural, and historical resources. Although these resources can overlap, the distinction is made here relative to the known resources of concern and investigations that have taken place.

### **3.7.1 Archaeological Resources**

Several well-documented archaeological sites in the region date to the Pre-Archaic period and contain the most widely known artifactual marker of this period, the Clovis-style projectile point. Prehistoric sites of this type can include such features as rock art; nomad campsites; and trash locations and sites containing primitive tool, bone, or other indications of land use prior to contact with European and indigenous American culture (*Storey County, 1993*). There are no sites in the Great Basin, however, containing unambiguous association of artifacts and extinct fauna (*Jennings, 1986; Willig and Aikens, 1988, as cited in Ebasco, 1993e*).

The Archaeological Records Management Division of the Nevada State Museum conducted archival research to identify archaeological activities and sites recorded with the State Historic Preservation Officer (SHPO). Table 3.7-1 identifies 17 previous survey projects identified in the vicinity of Tracy Power Station. Within a 3.2 km (2 mile) radius of the Tracy Power Station, approximately 30 recorded sites were identified. Nine of these are archaeological sites with substantial artifact deposits, and two are historic sites. The remainder are isolated finds of less than five artifacts.

In addition to the archival search, an Area of Potential Effect (APE) was identified at the Tracy Station site and a pedestrian field survey was conducted in May 1993. The survey team inventoried the APE, which consisted of 227 acres within the Tracy Power Station boundary (except for a small area that Mariah Associates (*1993*) previously surveyed for a proposed combustion turbine project); the SPPCo. property to the west of Tracy Power Station, containing evaporation and cooling ponds; SPPCo. land to the east of the Tracy Power Station; and private land currently under sand quarrying operations along and within 80 meters (262 feet) of the Southern Pacific Railroad tracks, extending for approximately 0.8 km

Table 3.7-1. Previous archaeological surveys in the vicinity of Tracy Power Station.

Report citation	Project Name and Sponsor	Project facility	Survey extent	Cultural Resources
Budy, 1979	Reno-Sparks Sewage Effluent Study, Jones & Stokes Associates	outfall pipeline	NA	NA
Bunch, 1984	I-80 Betterment, Nevada Dept. of Transportation	highway improvement	713 acres	2 prehistoric, 2 historic
Burke, 1990a	Reno-Sparks Effluent Pipeline, Black & Veatch Engineers	outfall pipeline	69 acres	16 sites
Burke, 1990b	Reno International Raceway, ROMP	racetrack	355 acres	6 sites, 5 isolates
Busby and Bard, 1979	Valmy-Mira Loma Transmission Line, Sierra Pacific Power Company	transmission line	NA	40 sites
Intermountain Research, 1985	Tracy Development Land Exchange, Tracy Development Company	land exchange	640 acres	2 sites, 8 isolates
Intermountain Research, 1987	Washoe County Fiber Optic Cable, Nevada Bell	fiber optic cable	10.2 miles	1 historic site
Intermountain Research, 1990	Granite Gravel Pit, Granite Construction	gravel pit	114 acres	1 prehistoric, 1 historic
D. Johnson, 1981	Patrick Development, Bureau of Land Management	road/utility easements	280 acres	4 sites, 2 isolates
F. Johnson, 1991	Southwest Gas Pipeline, Lumos & Associates	gas pipeline	13 miles	5 sites, 7 isolates
F. Johnson, 1992	Southwest Gas Pipeline, Lumos & Associates	gas pipeline	13 miles	1 site, 6 isolates
McNeil, 1983	Clark Weigh Station, Nevada Dept. of Transportation	weigh station	12.2	none
Moore, 1983	Phillips Geothermal Exploration, Phillips Petroleum	geothermal	6 drill sites	none
NA = Information not available.				

Table 3.7-1. Previous archaeological surveys in the vicinity of Tracy Power Station (continued).

Report citation	Project Name and Sponsor	Project facility	Survey extent	Cultural Resources
Peak & Associates, 1985	Patrick Reroute Transmission Line, Sierra Pacific Power Company	transmission line	2.4 acres	none
Rusco and Seelinger, 1974	Tracy-Valmy Transmission Line, Sierra Pacific Power Company	transmission line	NA	18 sites
Stearns, 1991	Patrick haul road, Nevada Dept. of Transportation	haul road	6 acres	1 historic trash scatter
Tomlinson, 1979	Material and Testing Survey, Nevada Dept. of Transportation	unknown	160	none

NA = Information not available.

Source: Ebasco 1993e.

(1/2 mile) west of the SPPCo. property line. Within the APE, eight archaeological sites and two isolated finds were recorded. The archaeological sites consisted of three large stone tool waste scatters (one of them badly damaged), three stone tool waste scatters of medium size, and two stone tool waste scatters of small size. The isolated finds included one projectile point fragment *and one bifacial tool fragment*.

Eight sites were identified (*using Smithsonian trinomials*), as follows:

- *26-St-191* is located on and around a sand dune near the Tracy Power Station's cooling pond.
- *26-St-192* is a light scatter of stone tool waste located on a flat between the Tracy Power Station's cooling pond and the cooling pond spoil pile.

- **26-St-193** is a very large and somewhat sparse lithic scatter. It is located at the upper edge of the second Truckee terrace, but is approximately 300 meters (984 feet) from the Truckee River.
- **26-St-194** is a scatter of stone tool waste approximately 40 meters (131 feet) in diameter that extends down the gentle slope of the second Truckee River terrace, approximately 200 meters (656 feet) from the river. (**26-St-195** is a similar site, also located on the terrace slope, about 40 meters (131 feet) away.)
- **26-St-195** is a scatter of stone tool waste approximately 40 meters (131 feet) in diameter that extends down the gentle slope of the second Truckee River terrace, approximately 150 meters (492 feet) from the river. (**26-St-194** is a similar site, also located on the terrace slope, about 40 meters (131 feet) away.)
- **26-St-196** is a small and sparse scatter of stone tool waste consisting of about 25 pieces of chert debitage (unused flakes and cores from the process of toolmaking) and one chert core located at the base of a hill slope next to a large and flat second terrace of the Truckee River.
- **26-St-197** consists of three pieces of silicate debitage located at the top of a knoll overlooking the second terrace of the Truckee River.
- **26-St-82** consists of the remains of a very large prehistoric lithic scatter first recorded during an archaeological survey for the Granite Construction Company's sand and gravel quarry (*Intermountain Research, 1990, as cited in Ebasco, 1993e*).

The proposed Piñon Pine Power Project could affect two of the sites, **26-St-193** and **26-St-82**. Site **26-St-82** has largely been destroyed by sand and gravel quarrying operations, retains no scientific value, and is not eligible for National Register nomination. In the area inspected (the upper portion of the site), quarrying activities had cut through the site deposits to a depth reaching 3 or 4 meters (10 to 13 feet).

Site **26-St-193** was further investigated by excavating test units and conducting shovel tests. The test excavation methods followed the Nevada Bureau of Land Management practices. The test methods

were also approved by the SHPO (*telephone conversation with E. Hattori, June 30, 1993*). A total of four test units were excavated. The results indicated that the site was ineligible for National Register nomination chiefly because it lacks an intact subsurface artifact deposit. Test excavations recovered most of the artifacts from the surface or the 0- to 10-cm (0 to 4 inches) level. The site is large (250 by 50 meters or 272 by 54 yards) but contains a low density of material widely scattered across the ground surface and concentrated in a few places at a maximum density of approximately 5 artifacts per square meter. In one place, artifacts appeared to be eroding out of a low rise, indicating the possibility of a subsurface artifact deposit. There were also indications of disturbance on site, in the form of grading or covering by rock tailings, but based on surface evidence, these patterns of disturbance were not entirely clear. Although the site contains a large number of surface artifacts, this alone does not make it eligible for National Register nomination. The majority of these artifacts are large flakes of basalt that were expediently struck from abundant, local materials. The site does not contain surface features such as rock structures or house pit depressions, petroglyphs, or other features, which would indicate that the site is unusual or could provide archaeologists with unique information about the area's prehistory.

### **3.7.2 Native American Cultural Resources**

Historical American Indian occupation of the area involved the former territories of the Washoe and Northern Paiute. The inhabitants of the project area belonged to a cultural and linguistic group that anthropologists have designated Northern Paiute. This group is closely related to the Ute and the Southern Paiute, Eastern, Western, and Northern Shoshone tribal and cultural groups that inhabited the remainder of the Great Basin as well as parts of the Colorado Plateau and Rocky Mountain areas at the time of first European contact. Based on ethnographic information, it is apparent that the Truckee River Canyon (which includes the project area) provided a good location for Paiute winter camps. The river provided access to several important food resources, including critical winter resources. The canyon contained floodplain and riparian zones that provided waterfowl, birds, plentiful firewood, Indian rice grass and giant wild rye seeds, and cattail seeds and shoots. The river provided fish, an all-important food during the winter months of scarcity. Ethnographic accounts mention that Paiute winter villages stretched continuously up the Truckee from the mouth to the Big Bend (approximately 24 km (15 miles) east of Tracy Station), and that approximately 930 Paiute inhabited this area in 1859 (*Fowler and Liljeblad, 1986*). By this time, however, European Americans had caused considerable decrease in Paiute population sizes and changes in their settlement patterns. It is likely that Paiute winter villages extended up the Truckee as far as Truckee Meadows, or to the boundary of Washoe territory, wherever that boundary might have been at a given time. The Washoe, whose ancestral lands include Reno, south to

Bridgeport and west to Auburn established colonies in 1917 at Reno and near Carson City, where they still exist. The Northern Paiute occupied an area just east of the Washoe from Lone Pine in the South, north into Oregon, and east to Battle Mountain. The Northern Paiute are today separated into bands with the Pyramid Lake Paiute (Kuyuidokado) located approximately 16 km (10 miles) from the proposed project site at the Pyramid Lake Paiute Reservation.

Three other reservations are located within 80 km (50 miles) of the proposed project: the Yerington Indian Reservation between Wabuska and Yerington, the Fallon Indian Reservation east of Fallon, and the Walker River Indian Reservation at Schurz, north of Walker Lake.

Cultural resource sites unique to the area have been located within the Truckee River Canyon and include prehistoric rock art with both pictographs and petroglyphs. Examples include the Largomarsino Petroglyph site, Court of Antiquity, Silver Lake City site, Verdi Petroglyph site, and other rock art sites at Spanish Springs, Reno, and Pyramid Lake. No such cultural resources related to Native American activities are known to exist on the project site.

In 1978, Congress passed the American Indian Religious Freedom Act (AIRFA) (42 USC 1996) to ensure that Native American religions would be protected and preserved. AIRFA specifies that American Indians will have access to sacred sites and the freedom to worship, and practice their traditional religions through ceremonies and rites. There are presently no Native American sacred sites of religious worship on the project property or within the affected property area. Neither the public scoping meetings nor the consultations with Indian Tribes have indicated the need to be aware of any Native American religious practices associated with the Tracy Power Station site.

The Cui-ui, as noted in section 3.6.3, is an endangered fish that relies on the Truckee River for spawning. Historically, the Pyramid Lake band of Northern Paiute Indians relied heavily upon annual spawning runs of Cui-ui for food. To aid protection and restoration of Cui-ui, the Tribal Council passed resolutions in 1969 and 1979 ceasing harvest of Cui-ui by non-Indians and tribal members, respectively. These resolutions were reemphasized in 1984 when the Council passed a motion reiterating the moratorium on a Cui-ui fishery.

In 1972, the U.S. Fish and Wildlife Service (USFWS) developed Cui-ui propagation techniques and established the first Cui-ui culture facility at Hardscrabble Creek near Sutcliffe, NV. A hatchery operation began in 1973 after the USFWS improved the facilities and production techniques. After

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completion of the David Koch Cui-ui Hatchery by the Tribe and training of tribal personnel in Cui-ui culture techniques, the Service transferred operation and control of the program to the Tribe in 1977. Hatchery operations continue to the present.

The *second revision of the* Cui-ui Recovery Plan was *prepared* in 1992 by a Cui-ui recovery team composed of representatives from the USFWS, NDOW, and Pyramid Lake Paiute Indian Tribe. The plan has been instrumental in guiding recovery actions.

### **3.7.3 Historic Resources**

Historic sites of the area relate to the intrusion of the culture of United States citizens (particularly during the discovery of the Comstock Lode), Native Americans, Early Euro-American explorers, fur trappers, emigrants to California, settlers, and ranchers. Historic sites include such features and artifacts as town sites, buildings and building sites, railroad structures and abandoned mine sites (*Storey County, 1993; Lyon County, 1990*). There are no known National Register or National Register eligible buildings or properties located on the proposed project site.

## **3.8 Socioeconomic Resources**

This section describes the socioeconomic resources of the three-county area where the proposed project would be located: Storey County and adjacent Lyon and Washoe Counties. Historic and project population figures for this area show significant growth. The housing vacancy rate for the affected county is approximately 9 percent and the unemployment rate was 5.9 percent in 1992. Public services, such as police protection, fire protection, schools, health care, and parks and recreation also are discussed.

### **3.8.1 Demographics**

Historical and projected populations for Lyon, Storey, and Washoe Counties are presented in Table 3.8-1; impacts are discussed in section 4.1.8.1. Included within these counties are the Yerington Paiute Reservation in Lyon County, and the Reno/Sparks Indian Colony and the Pyramid Lake Paiute Tribe in Washoe County.

Table 3.8-1. Population and growth projections.

Area	1980	1990-91	2000 (est)	2010 (est)	Actual Annual Growth Rate <sup>1</sup> 1980-1990	Projected Annual Growth Rate <sup>1</sup> 1990-2010
Lyon County	13,594	20,001	24,984	29,387	3.9%	1.9%
City of Yerington	2,021	2,367	NA	NA	1.6%	NA
Storey County	1,503	2,526	3,155	3,711	5.3%	1.9%
Washoe County	193,623	254,667	321,140	376,460	2.8%	2.0%
City of Reno	100,756	133,850	NA	NA	2.9%	NA
City of Sparks	40,780	53,367	NA	NA	2.7%	NA
Pyramid Lake Paiute Tribe	NA	1,798	NA	NA	NA	NA
Yerington Paiute Reservation	NA	659	NA	NA	NA	NA
Reno-Sparks Indian Colony	NA	724	NA	NA	NA	NA
(Total)	208,720	277,194	349,279	409,558	2.9%	2.0%
State of Nevada	800,508	1,201,833	NA	NA	4.1%	NA

Source: State of Nevada (1992a) for county and statewide historical U.S. Bureau of Census data  
U.S. Department of the Interior (1992 and 1993) for Native American population data  
SPPCo. (1993g) for 1990-2010 population growth projections.

<sup>1</sup> These growth rates are annual compounded averages.

The total 1990 population for the three counties is estimated to be 277,200 with over 90 percent of the population residing in Washoe County (approximately 255,000). The majority of the Washoe County population is centered around and in the Reno/Sparks area. All three counties experienced significant growth within the last decade, ranging from an approximate 32 percent increase for Washoe County, to a 68 percent increase for Storey County. Tribal enrollment was estimated in 1991 at 659 for the Yerington Paiute Reservation (located approximately 80 km (50 miles) from the project site), 724 for the Reno/Sparks Indian Colony, and 1,798 for the Pyramid Lake Paiute Tribe. Significant population growth is expected to occur in the affected area through the year 2010. (Table 3.8-2 provides a population breakdown by age for Washoe, Storey, and Lyon Counties.) Population figures in July 1993 compared to 1990 population were: Lyon County—23,750, up 0.8 percent, Storey County—2,850, up 1.1 percent; and Washoe County—271,770, up 2.3 percent. Reno also grew by 2.3 percent; Sparks' population increased by 1.1 percent.

Table 3.8-2. Percent of population by age.

Age	Lyon	Storey	Washoe	3-County Area Total	State of Nevada
<5	7.9%	6.6%	7.4%	7.4%	7.7%
5-17	19.4%	16.6%	15.8%	16.0%	17.0%
18-20	2.8%	2.4%	4.3%	4.2%	4.0%
21-24	3.4%	3.6%	6.2%	6.0%	5.9%
25-44	29.0%	34.8%	36.3%	35.8%	34.5%
45-54	11.6%	15.5%	11.2%	11.3%	11.3%
55-59	5.0%	4.9%	4.4%	4.4%	4.5%
60-64	5.8%	5.2%	4.2%	4.3%	4.4%
65-74	10.3%	6.4%	6.7%	6.9%	7.1%
75-84	4.1%	3.6%	2.9%	3.0%	2.9%
>85	0.8%	0.5%	0.7%	0.7%	0.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

*Source: State of Nevada, 1992a.*

### 3.8.2 Local and Regional Economic Activity

#### Employment

Most employment opportunities in the outlying areas surrounding the Tracy Power Station are heavily dependent on the service industry. Mining, construction, manufacturing, transportation, public utilities, retail trade, finance, and government also provide other means of employment. SPPCo. has 1,730 full-time employees servicing a 168,350 km<sup>2</sup> (65,000 square mile) area with approximately 251,000 electric customers. In addition, the Westpac Utilities division serves 83,000 natural gas customers and 57,000 water consumers in the Reno/Sparks area.

Employment by industry in 1990 is depicted in Table 3.8-3. This table shows that service-related employment is the dominant component of the affected area's economy (39 percent). Primary services include hotel, gaming, and recreation, particularly apparent in Washoe County; these services constitute

Table 3.8-3. Regional economic activity.

Employment by Industry (1990)	County			Total Area	State of Nevada
	Lyon	Storey	Washoe		
Mining	157 (3.1%)	160 (21.6%)	1,445 (1.0%)	1,762 (1.2%)	14,357 (2.3%)
Construction	432 (8.5%)	* (*)	7,514 (5.2%)	7,946 (5.3%)	48,688 (7.8%)
Manufacturing	1,240 (24.4%)	20 (2.7%)	8,670 (6.1%)	9,930 (6.7%)	26,216 (4.2%)
Transportation and public utilities	310 (6.1%)	60 (8.1%)	9,826 (6.8%)	10,196 (6.8%)	32,458 (5.2%)
Retail Trade	879 (17.3%)	190 (25.7%)	33,524 (23.2%)	34,593 (23.0%)	125,462 (20.1%)
Finance, insurance, and real estate	142 (2.8%)	* (*)	7,225 (5.0%)	7,367 (4.9%)	28,089 (4.5%)
Services	1,021 (20.1%)	170 (23.0%)	57,945 (40.1%)	59,136 (39.3%)	273,400 (43.8%)
Government	899 (17.7%)	140 (18.9%)	18,352 (12.7%)	19,391 (12.9%)	75,528 (12.2%)
Total Employment (Annual Average)	5,080	740	144,500	150,320	624,200
Unemployment Rate (1992) <sup>1</sup>	7.5%	5.9%	6.3%	NA	6.6%
Per Capita Income					
1985	\$12,273	\$14,909	\$16,633	\$16,303	\$14,510
1989	\$16,097	\$20,127	\$20,920	\$20,565	\$18,392
Taxable Sales (\$000)					
1985	\$54,724	\$9,362	\$1,933,000	\$1,997,086	\$7,968,089
1991	\$83,879	\$15,728	\$2,703,533	\$2,803,140	\$14,514,119

\* Indicates less than 10 employees.  
Employment by industry does not include agricultural employment.  
Unemployment rate applies to entire civilian labor force.  
NA = Not Available  
Source: State of Nevada, 1992a.  
<sup>1</sup>State of Nevada, 1993d.

more than 40 percent of the jobs. Other significant employment includes the retail trade (23 percent) and government (approximately 13 percent). In 1992, unemployment affected the region at a rate of 7.5 percent in Lyon County, 5.9 percent in Storey County, and 6.3 percent in Washoe County. The 1992 unemployment figure for the state of Nevada was 6.6 percent (*State of Nevada, 1993d*).

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Within a 80-km (50-mile) radius of Tracy Station lies the Reno/Sparks area, the second largest population area in the state of Nevada. Gaming and tourism services are the largest employer, but Reno also has light industry and warehousing to supplement its economy. Lake Tahoe, a destination resort area, is also within the area and has year-round activities with boating, swimming, and camping during warm months and snow skiing in the winter.

### **Income**

Per capita income for the three counties increased significantly during the 1980s, with Lyon County increasing 31 percent, Storey County increasing 35 percent, and Washoe County increasing 26 percent (see Table 3.8-3).

Native American employment figures, supplied by the Bureau of Indian Affairs, showed that approximately 22 percent of the Yerington Paiute, 20 percent of the Reno/Sparks Indian Colony, and 61 percent of the Pyramid Lake Indian population earned less than \$7,000 per year. Figure breakdowns for incomes over \$7,000 per year were not available.

### **Tax Revenue**

The general fund revenues for the state of Nevada (Fiscal Year 1991) are presented in Table 3.8-4. Much of this tax revenue is split between the state and counties. For example, in Storey County, the sales and use tax is 6.75 percent. Of this amount, 2 percent is forwarded to the state while the remaining 4.75 percent remains in Storey County (*SPPCo., 1993f*). Other taxes are also collected by the county and retained for its use.

These taxes form the basis for local budgets in Lyon, Storey, and Washoe Counties. From 1986 to 1991, the combined local government budget (including budgets for the county school districts, cities, towns, and special improvement districts) for Lyon County rose from approximately \$24 million to \$45 million (an

**Table 3.8-4. Nevada general fund revenues.**

Gaming	41.2 percent
Sales and use	33.7 percent
Other	7.4 percent
Insurance	7.2 percent
Cigarette	3.9 percent
Property	2.8 percent
Casino entertainment	2.4 percent
Liquor	<u>1.4 percent</u>
Total	100 percent

(Source: *State of Nevada, 1992a*).

88 percent increase), Storey County budget rose from approximately \$3.5 million to \$6.6 million (an 89 percent increase), and Washoe County rose from approximately \$495 million to \$730 million (a 47 percent increase). For the state of Nevada as a whole, gaming and sales/use tax revenues constitute almost 75 percent of total general fund revenues. SPPCo.'s electric properties were valued at \$985 million; the Department of Taxation issued a taxable value assessment of \$301.6 million, a 4.2 percent increase. SPPCo. is the leading Nevada property taxpayer, with a 1992-1993 tax bill of \$10.3 million. This amount, 8.2 percent higher than for 1991-1992, will be distributed among 15 of Nevada's 17 counties. Washoe County will receive \$4.3 million (41 percent).

### **3.8.3 Public Services**

#### Housing

In 1990, there were approximately 122,000 residences in the three-county area. Over half of these units (55 percent) were owner-occupied, and the remaining units were rentals. The vacancy rate for all units was approximately 9 percent (11,000 units). Approximately one-third of these vacancies were rental properties (3,962), and approximately 11 percent (1,195) were for sale only. The bulk of the remaining vacancies (30 percent) were made up of "seasonal, recreational, or occasional use." The 1990 median house purchase price in the affected area ranged between \$100,000 and \$125,000. Median monthly rentals ranged from \$400 to \$449 in the region (*U.S. Bureau of Census, 1990, as cited in Ebasco, 1993f*).

#### Police Protection

Owing to its large tourist population, Nevada's 1990 per capita spending for state and local law enforcement was the highest in the United States. Likewise, Nevada ranked third in the nation in per capita spending on penal corrections. Nevada's crime rate index of 6,064 (per 100,000 population), although slightly higher than that of the United States (5,820), was slightly lower than the average for the western states (6,405). Storey County residents rely solely upon the Storey County Sheriff's Office for police protection. There are no municipal police departments in the county.

Fire Protection

Table 3.8-5 identifies the number of fire departments in the three-county area. In Storey County, fire protection is provided by the Nevada Division of Forestry (NDF) on a contractual basis. Additional resources are provided through agreements with the United States Forest Service and the Bureau of Land Management.

**Table 3.8-5. Fire departments in the 3-county area.**

	Lyon	Storey	Washoe	Total
Volunteer	12	3	14	29
Paid/ partial paid	3	2	7	12
Other	2	0	7	9
Total	17	5	28	50

*Source: State of Nevada, 1992b.*

Fire protection and suppression systems, including a fire protection water loop, are currently in place at the Tracy Power Station. Fire protection water is supplied from the existing cooling pond to the fire protection water loop at 9 cfs (4,000 gpm).

Schools

The 1992-1993 school year student-teacher ratio ranged from 13.9 students per teacher for Storey County to 18.3 for Washoe County; the average ratio for the region was approximately 18.1. This compares favorably to Nevada as a whole, which has a ratio of 18.5 students per teacher. Total public school expenditures in 1991 ranged from \$5,314 per student in Washoe County to \$8,268 per student in Storey County with an average for the affected area of \$5,452. Per student funding for public education in the affected area is approximately 86 percent of the average funding per student in the state (\$6,310).

Table 3.8-6 shows kindergarten through high school enrollment in the affected area for the school year 1992-1993.

Health Care

Health care services include those provided by physicians, dentists, registered and practical nurses, and advanced nursing practitioners. For the affected area, the ratio per 1,000 population is 2.13 *for* physicians, 0.56 *for* dentists, and 9.28 *for* nurses and advanced nursing practitioners. For the entire

Table 3.8-6. Three-county area school enrollment, 1992-93.

	Lyon	Storey	Washoe	Total
<b>HIGH SCHOOL</b>				
Number of schools	4	1	11	16
Enrollment	1,201	127	10,737	12,065
<b>INTERMEDIATE</b>				
Number of schools	3	1	10	14
Enrollment	1,333	97	6,330	7,760
<b>ELEMENTARY</b>				
Number of schools	6	2	54	62
Enrollment	1,967	224	24,953	27,144

*Source: State of Nevada, 1993b.*

state, the ratios per 1,000 population are 1.46 for physicians, 0.39 for dentists, and 6.69 for nurses and advanced nursing practitioners. The medical center or hospital nearest to the project site is Sparks Family Hospital, a 150-bed health facility located east of Sparks, NV, 16 km (10 miles) from the Tracy Power Station. A listing of hospitals and licensed beds in the affected area is provided in Table 3.8-7. The level of health care services in the affected area compares favorably with Nevada as a whole. Medical emergency transportation from areas east of the Tracy Power Station (e.g., Fernley) to Washoe Medical Center in Reno are provided by the helicopter services of Care Flight.

Table 3.8-7. Hospitals and beds in the 3-county area.

<u>County</u>	<u>Facility Name</u>	<u>No. of Licensed Beds</u>
Lyon	South Lyon Medical Center	14
Washoe	St. Mary's Regional Medical Center	367
Washoe	Sparks Family Center	150
Washoe	Washoe Medical Center	528
Total		1,059

*Source: State of Nevada, 1993c.*

### Utilities

The Reno/Sparks area is the largest municipal water user on the Truckee River. Both cities and some of the nearby unincorporated areas are served by SPPCo., which not only provides water directly to customers but also is a water wholesaler to several small purveyors (*California Department of Water Resources, 1991*). Water at the Tracy Power Station is supplied from river water and groundwater. Many of the small water purveyors rely entirely on groundwater. The Nevada State Engineer has established controls to restrict groundwater pumping to avoid potential overstressing of the surrounding aquifer system. Groundwater pumping and water levels are being monitored to evaluate potential impacts from local development. The present per capita water demand within SPPCo.'s service area is 260 gallons per day (gpd). Combining project per capita demand with population projection results in a total projected range of annual water demand for SPPCo.'s service territory of 77,000 to 90,202 acre-feet in the year 2012.

Because of its limited availability, water usage is rationed among competing uses by the assignment of water rights. Basically, there are two kinds of water rights: consumptive and non-consumptive. Consumptive water rights pertain to water consumed by users, and therefore, not available for other uses. Non-consumptive water rights pertain to water used and reused by a number of entities; that is, water used by one entity is returned to the source for use by others. Water rights in the Truckee Meadows currently sell for \$2,000-\$3,000 per acre-foot; subsidized water rights in Fallon sell for \$400-\$600 (*Partlow, 1993*). The Tracy Power Station has annual consumptive water rights of 3,500 acre-feet/year (4.9 cfs) from the Truckee River and 600 acre-feet/year (0.84 cfs) of consumptive groundwater rights as presented in Table 3.8-8. Current consumption is approximately 1,500 to 1,600 acre-feet/year (2.1 to 2.24 cfs).

The Truckee Meadows Water Reclamation Facility (TMWRF) handles the majority of wastewater generated in the cities of Reno and Sparks. An average of 27 mgd is processed at the plant, which has a capacity of 40 mgd. The Tracy Power Station uses a septic system for waste disposal.

Historical and projected electricity sales information for SPPCo.'s service territory are presented in Table 3.8-9. Mining (24.49 percent), Nevada residential customers (22.03 percent), and casinos/hotels (10.55 percent) made up of more than 50 percent of SPPCo.'s 1992 sales. SPPCo. is projecting a 2.5 percent annual average increase in electricity sales over its 20-year planning horizon (1992-2011), and in its 1993 Resource Plan (*SPPCo., 1993c*), projected a need for new system generating capacity to meet this increasing demand for electricity.

Table 3.8-8. Tracy Power Station's consumptive water rights.

Certificate No.	Source	Use	Annual (acre-feet)	Remarks
6572	River	Industrial	338.0	Orr Ditch Claim No. 629
6229	River	Industrial	130.0	Orr Ditch Claim No. 643
6230	River	Industrial	699.3	Orr Ditch Claim No. 641
6231/9207	Well	Industrial	600.0	Well Nos. 1 & 2
8768	River	Industrial	948.0	Truckee River Claim No. 14
9199	River	Industrial	301.0	Truckee River Claim No. 639
9200	River	Industrial	186.0	Truckee River Claim No. 640
9201	River	Industrial	576.0	Truckee River Claim No. 642
9202	River	Industrial	322.0	Truckee River Claim No. 645
Total			4,100.3	

Source: SPPCo., 1993d, as cited in Ebasco, 1993f.

### Parks and Recreation

In 1989, the state of Nevada had approximately 142,000 acres of state parks and recreation areas accommodating approximately 3 million visitors. Major public outdoor recreation areas in the three-county affected area include the following:

- Rancho San Rafael;
- Galena Creek Park;
- Mt. Rose National Forest;
- Fort Churchill State Park;
- Truckee River Recreation Area;
- Davis Creek Park;
- Bowers Mansion Park;
- Dayton State Park; and
- Desolation Wilderness Area.

Table 3.8-9. SPPCo.'s historical and projected electricity sales (base case).

Sales Sector	Percent of Total 1992 Sales	Estimates of Annual Average Growth Rate		
		1982-1991	1992-2011	1982-2011
Nevada Residential	22.03 %	3.39 %	2.21 %	2.51 %
California Residential	4.45 %	0.64 %	0.98 %	0.82 %
California Other	4.54 %	2.77 %	1.11 %	1.65 %
Mining	24.49 %	12.76 %	3.67 %	6.90 %
Casinos/Hotels	10.55 %	4.26 %	2.61 %	3.08 %
Irrigation	2.25 %	4.11 %	-3.20 %	-0.42 %
Street Lights	0.30 %	-2.64 %	0.48 %	-0.49 %
Manufacturing	5.35 %	6.31 %	2.69 %	4.18 %
Office	7.21 %	3.85 %	2.53 %	2.94 %
Retail	3.60 %	5.06 %	2.62 %	3.36 %
School/Education	1.90 %	7.94 %	2.86 %	4.45 %
Health	1.64 %	7.03 %	1.99 %	3.57 %
Groceries	2.35 %	4.82 %	2.33 %	3.27 %
Restaurants	1.53 %	2.57 %	2.28 %	2.43 %
Warehousing	2.23 %	5.21 %	1.97 %	2.99 %
National Defense	1.52 %	11.89 %	-0.84 %	2.57 %
Utilities	2.37 %	7.42 %	2.09 %	4.00 %
Agriculture, Construction, Misc.	1.71 %	-1.35 %	1.27 %	0.68 %
Total	100.00 %	5.30 %	2.50 %	3.49 %

*Source: SPPCo., 1993c.*

### 3.8.4 Environmental Justice

On February 11, 1994, Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" was published in the Federal Register (59 FR 7629), requiring Federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. Currently, no formal guidelines have been adopted to implement the Executive Order; however, EPA has published relevant studies and information on environmental justice and is leading an interagency task force to address the issues of environmental justice. DOE is a participating member of this task force. In July 1993, DOE distributed a memorandum stating the Agency's commitment to environmental justice, providing information to better understand environmental justice issues, and requesting input on how DOE should consider environmental justice in its NEPA documents (*DOE Memorandum of July 22, 1993 from the Office of NEPA Oversight*).

An examination of county master plans and land use maps for the area surrounding the project site indicates no minority or low-income communities immediately adjacent to or in the vicinity of Tracy Power Station, either in Storey or Washoe County. The nearest resident is approximately one mile from the plant site. In 1989, Storey County had 110 Native Americans and 10 Hispanics living in the county. There were fewer than 10 African Americans living in the county. The majority of the county's population is located in the southern portion, in the vicinity of Virginia City, or south of Reno. The area surrounding the proposed project site is rural in nature and sparsely populated. See section 3.8.1 (Demographics) for a more complete discussion of the area.

In the document Reducing Risk for All Communities (EPA, 1992), Native Americans are recognized as "a unique racial group that has a special relationship with the Federal government and distinct environmental problems." The report noted that Tribes may have a higher risk for certain pollutants because of higher than average consumption rates of wild food and fish. The closest Native American group to Tracy Power Station is the Pyramid Lake Paiute Tribe. The Pyramid Lake Indian Reservation covers approximately 306,273 acres. The southern boundary of this Reservation is located approximately 24 km (15 miles) from Tracy Power Station. As noted in section 3.7, Cultural Resources, the Pyramid Lake Paiute Tribe has a history of harvesting the Cui-ui for subsistence. However, the Tribe passed a resolution in 1979 to cease harvesting the fish. Since the early 1970's, the Tribe has, with government support and coordination, been active in measures to maintain and increase the viability of the Cui-ui. In 1977, the Tribe took control and operation of the David Koch Cui-ui Hatchery.

SPPCo., which is a major employer in northern Nevada, is an equal employment opportunity company with an Affirmative Action Plan. The Plan pertains to the recruitment, hiring, training, promotion, transfer, and termination of personnel.

### **3.9 Health and Safety**

Health and safety programs governing potential worker impacts at the Tracy Power Station have been developed by SPPCo.'s corporate health and safety staff. The corporate programs were developed to be used at a variety of plant locations and field divisions. The corporate health and safety staff are responsible for ensuring that the programs are effectively instituted. These programs include the following:

- Respiratory Protection;
- Hazard Communication;
- Chemical Hygiene;
- Hearing Conservation;
- Bloodborne Pathogens;
- Steam Plant Tagging Rules (Lockout/Tagout); and
- Confined Space Entry.

The Respiratory Protection Program is consistent with the requirements of OSHA's Respiratory Protection Standard (29 CFR 1910.134). This program was developed to control occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors. Although the primary objective of the program is to prevent atmospheric contamination through accepted engineering control measures, when these controls are not feasible or while they are being instituted, appropriate respirators are required. SPPCo.'s written operating procedures govern the selection and use of respirators. In addition, all employees who are required to wear a negative pressure respirator are provided with a medical questionnaire and undergo pulmonary function testing. The results of the questionnaire and the pulmonary function test are reviewed by a medical officer for evaluation and recommendations.

The Hazard Communication Program covers all the required elements of the OSHA Hazard Communication Standard (29 CFR 1910.1200). This program ensures that the hazards of all chemicals are evaluated and that information concerning these hazards is transmitted to employees. The Hazard

Communication Program prescribes forms of warning regarding potential hazards and describes employee training requirements. Presently, SPPCo. is completing development of an on-line system for maintaining and updating material safety data sheets (MSDS) to reduce the manual effort of updating and maintaining all the MSDS books provided in the plants. All MSDS information will be available to SPPCo. employees. A regulatory specialist is responsible for plant-specific training, chemical labeling, and hazardous materials and hazardous waste handling.

To ensure protection of employees from health hazards associated with hazardous chemicals, SPPCo.'s Chemical Hygiene Program for the laboratory at the Tracy Power Station meets the requirements of 29 CFR 1910.1450. The program includes standard operating procedures relevant to health and safety considerations and criteria to be used for determining and implementing control measures to reduce employee exposure to hazardous chemicals. The Tracy Power Station laboratory technician is trained annually on the standard and is responsible for quarterly air velocity checks of the laboratory hood.

SPPCo.'s Hearing Conservation Program is more protective than the OSHA standard (40 CFR 1910.95), requiring the use of hearing protectors at exposure levels at or above 85 dBA. Noise surveys have been conducted and the use of hearing protection is required in posted areas of the plant. Employee training and audiometric testing are conducted.

A Bloodborne Pathogen program in compliance with 29 CFR 1910.1030 has been developed and instituted for all plants and field divisions. It includes engineering and work practice controls, requirements for procedures, training programs, and communications protocols.

The Steam Plant Tagging Rules are included in SPPCo.'s Handbook of Safety Rules. This program was instituted to control the potential for exposure to the release of hazardous energy for all work conducted on rotating or reciprocating equipment, boiler or unit outages, and electrical equipment.

The SPPCo. corporate safety staff has developed a Confined Space Entry Procedure to minimize the potential impacts to workers performing work activities in confined or limited entry spaces. This program was designed to comply with 29 CFR 1910.146 and to protect SPPCo. workers from the potential hazards of confined space entry. Confined spaces include silos, storage bins, and hoppers that are not designed for continuous employee occupancy. Any employee entering a confined space is issued appropriate personal protective equipment.

The Chemical Emergency Response Plan provides procedures for incidents (i.e., accidents), such as fires; spills, leaks, and vapor releases; and explosions, including operations for exposure control, evacuation, first aid procedures, and personal protective clothing and emergency equipment. This plan defines policy, identifies individual responsibilities, lists emergency response procedures, and provides hazard data on the chemicals used on site. An incident on-scene coordinator is responsible for incident response. The plan was developed to protect both worker and the general public's health and safety.

In addition, unauthorized personnel are prevented from entering the Tracy Power Station site by a perimeter fence that surrounds the property. For additional security and safety, fences also surround several site facilities, such as the switchyards.

### **3.9.1 Electromagnetic Fields**

Electric power transmission lines produce an electromagnetic field (EMF) around them. The issue of EMFs potentially affecting human health has become increasingly visible over the past several years. Many epidemiological and animal studies have been conducted to assess the health effects associated with EMFs. The National Radiological Protection Board (1992) stated, "The epidemiological findings that have been reviewed provide no firm evidence of the existence of a carcinogenic hazard from exposure of paternal gonads, the fetus, children, or adults to the extremely low frequency EMFs that might be associated with residences near major sources of electricity supply, the use of electrical appliances, or work in the electrical, electronic, and telecommunications industries." EPA is currently undergoing a review of available evidence to determine if EMFs may be classified as carcinogens (EPA, 1990d); EPA has not yet reached any conclusions.

The existing Tracy substation is supplied at 120 kilovolts (kV) by SPPCo. There are two 345 kV transmission lines from Tracy Station to the Reno area, one to the north (North Valley Road Substation) and one to the south (Mira Loma Substation) as well as two 345 kV lines east, to the North Valmy plant. A typical 120 kV line electric field strength at the edge of the right-of-way is 0.9 kV/meter and for 345 kV lines it is 1.5 kV/meter. The average right-of-way width for 120 kV is 23 to 24 meters (75 to 80 feet) wide.

### **3.10 Hazardous and Toxic Materials/Waste Management**

Solid and hazardous wastes generated from existing plant operations include a variety of chemicals used in water and wastewater treatment, blowdown water from the circulating and boiler water systems, small amounts of hazardous wastes generated from routine maintenance and normal operations, and common "wastebasket" trash. Waste management procedures at Tracy Power Station are specified in a manual compiled specifically for the plant titled "Hazardous Waste Management Plan." The plan's purpose is to provide plant personnel with the tools needed to identify the types of solid and hazardous wastes that are produced and to provide programs and specific procedures for managing these wastes in compliance with Federal, state, and local requirements. Pertinent regulations include the Resource Conservation and Recovery Act (RCRA) on the Federal level, Nevada Revised Statutes (NRS) on the state level, and relevant Storey County ordinances at the local level. In the event of conflict between the requirements of Federal, state, or local regulations, the more stringent interpretation prevails. RCRA Subtitle D covers procedures for solid waste. Hazardous waste is covered by RCRA Subtitle C. RCRA provides "cradle-to-grave" management of solid and hazardous waste through regulatory requirements imposed on generators and transporters of wastes and operators of treatment, storage, and disposal facilities. NRS, Title 40, section 444.440, states that it is Nevada's policy to regulate the collection and disposal of solid waste in a manner that will:

- protect public health and welfare;
- prevent water or air pollution;
- prevent the spread of disease and the creation of nuisances;
- conserve natural resources; and
- enhance the beauty and quality of the environment.

Solid waste is defined in the NRS as "all putrescible and nonputrescible refuse in solid or semisolid form, including, but not limited to, garbage, rubbish, junk vehicles, ashes or incinerator waste, ...solid or semisolid commercial and industrial waste". Storey County ordinances incorporate both Federal and state solid and hazardous waste regulations by reference. Chapters 8.10 and 8.32 provide guidelines for the management of waste including the operation and permitting of waste disposal facilities. Although authorized by the NRS to levy fees, the Board has established that no per-ton fees are required for waste generated within Storey County.

## 4. ENVIRONMENTAL CONSEQUENCES

This chapter analyzes the potential impacts to human and environmental resources resulting from construction and operation of the proposed Piñon Pine Power Project at the site in Tracy Station, NV. Analysis of the potential impacts resulting from the no-action alternative also are provided. A summary of proposed mitigation and related monitoring activities is included in the final section of this chapter.

### 4.0 Summary of Changes Since the DEIS

*The section on setting (4.1.1) was revised to identify the reduction in stack height. In section 4.1.2.1, information on construction emissions has been changed to reflect the completion of grading activities during the first year of construction. In addition, where applicable, revised emission amounts have been provided. These revised numbers are based on the new emission sources and design modifications presented in Chapter 2. Specific consequences to air emissions and concentrations have resulted from the design changes that were made since the Draft EIS was issued. These design changes resulted in changes in the maximum ambient ground-level concentrations, which had been predicted in the Draft EIS. However, the maximum predicted concentrations were still much less than PSD increments (the standards used as yardsticks to evaluate the results). Results of the PSD analysis for SO<sub>2</sub> were slightly greater because the decreased stack height allowed emissions to reach the ground in greater concentrations from the lower release height (see section 4.1.2.1). For example, the annual SO<sub>2</sub> concentration increased from 1.9 µg/m<sup>3</sup> to 2.2 µg/m<sup>3</sup>, compared with the PSD increment of 20 µg/m<sup>3</sup>. However, for the NAAQS analyses for SO<sub>2</sub> (which included emissions from the existing Tracy sources), the maximum concentrations decreased slightly due to the design changes (see section 4.1.2.1). This result is due to the fact that the existing stack at Tracy Unit #3 has a height of 91 meters (300 feet), and emissions from Unit #3 were predicted to contribute maximum cumulative impacts at nearly the same downwind location as a 91-meter (300-foot) stack for the proposed project, but would not contribute maximum impacts at the same location with a lower 68.5-meter (225 feet) for the proposed project. However, the maximum predicted NAAQS concentrations for SO<sub>2</sub> in this Final EIS are actually higher than those for the Draft EIS because the revised air dispersion modeling used an entire year of meteorological data from the 100-meter (325 feet) tower at Tracy as opposed to the 5 months of data used previously. The concentration increased from 34 µg/m<sup>3</sup> to 52 µg/m<sup>3</sup>, compared with the NAAQS of 80 µg/m<sup>3</sup>.*

*For the  $PM_{10}$  analyses, nearly all of the maximum predicted concentrations for both the PSD and NAAQS analyses were reduced in the Final EIS because of a combination of factors including lower emissions and less downwash effects downwind of facility structures (see section 4.1.2.1). For example, the annual NAAQS concentration decreased from  $48 \mu\text{g}/\text{m}^3$  to  $43 \mu\text{g}/\text{m}^3$ , compared with the NAAQS of  $50 \mu\text{g}/\text{m}^3$ . The only exception is that the maximum predicted 24-hour NAAQS concentration increased slightly from  $120 \mu\text{g}/\text{m}^3$  to  $127 \mu\text{g}/\text{m}^3$ , but the prediction remains less than the NAAQS of  $150 \mu\text{g}/\text{m}^3$ . This Final EIS incorporates the results of all of the design changes.*

Section 4.1.2.1 also now includes the results of additional air quality modeling that was performed for the Nixon and Wadsworth areas. Section 4.1.2.2 has been updated to include the new fog modeling analysis that was completed subsequent to publication of the Draft EIS. The section on acidic deposition (section 4.1.2.3) has been completely rewritten to be more comprehensive. Section 4.1.4 presents actual water flow data for 1992 rather than the approximations provided previously and archaeological resources discussed in section 4.1.7.1 are identified using Smithsonian trinomials. The mitigation section (section 4.3) was completely rewritten to provide more comprehensive information on measures that have been incorporated into the proposed project and those measures that have been considered. Detailed analyses on air emissions controls and cooling options have been included. The analysis on LASH reuse options has been moved from Appendix G of the Draft EIS and added to this mitigation discussion. In addition, clarifying information has been added to the chapter in response to public comments.

## **4.1 Environmental Impacts of the Proposed Action**

This section analyzes the potential impacts to human and environmental resources resulting from construction and operation of the proposed Piñon Pine Power Project at the Tracy Power Station. The operating life of this plant would be expected to exceed twenty years following an initial 42-month demonstration period. Organization of information in this section follows the format presented in Chapter 3 (Affected Environment) and includes discussions on the setting (aesthetics), atmospheric conditions, geology and soils, water resources, land use, biological resources and biodiversity, cultural resources, socioeconomic resources, health and safety, hazardous and toxic materials/waste management, noise, and pollution prevention. The criteria that were used for environmental impact assessments are presented in Appendix A. This appendix also describes the types of impacts discussed: direct, indirect, short-term, and long-term. (Cumulative impacts are discussed in Chapter 6.)

#### 4.1.1 Setting

The proposed Piñon Pine Power Project would be located west of the existing Tracy Power Station administration offices. The tallest structures associated with the project would be the stack (up to **68.5 meters (225 feet) from grade**), the gasifier structure (55 meters (180 feet) from grade), and the cooling tower (15 meters (50 feet) from grade). SPPCo. also is proposing to construct a coal off-loading facility south of the combustion turbine/heat recovery steam generator (CT/HRSG). An emergency flare system is incorporated into the plant design. Storage facilities for ash, lime, coke breeze, and coal, in addition to propane storage tanks (if needed for tertiary fuel supply) would be installed. A spray-type **double-lined** evaporation pond would be constructed to receive boiler and cooling tower discharges. Construction of a new primary switchyard and upgrades to the existing railroad spur are also planned. Proposed structures as they would be integrated with existing facilities are shown in Figure 4.1.1-1.

As stated in section 3.1, Setting, the existing site was found to have moderate to low scenic quality. Factors considered in the assessment included distance from the project; visibility conditions; view orientation and duration; existing structures (buildings, exhaust stacks, cooling towers, transmission towers); and the degree of change in line, form, color, or texture that the proposed project features would create from each viewpoint. A detailed description of this analysis is provided in the Aesthetic Resources Technical Report, available in the reading rooms (see Appendix H).

**Construction Impacts.** Construction of the proposed Piñon Pine Power Project would produce short-term direct impacts by changing visual resources because of the activities being conducted and the equipment stored on-site; but would not have significant long-term impacts on the surrounding area because the facilities planned for construction are of similar dimensions to those already present on the site. Standard dust-control measures would be employed to control fugitive dust emissions during construction. Most of the proposed project site currently is barren, and only a small amount of vegetation would be removed during construction. The majority of vegetation to be removed consists of invader species, which are not native to the area. A small (¼ acre) stand of Indian ricegrass mixed with about 20 shrubs (*Artemisia tridentata*, *Grayia spinosa*, *Atriplex canescens*, *Atriplex confertifolia*) would be removed to make room for the coal storage area. Consequently, although the facilities would enlarge an already developed area, the magnitude of increase would not be great.

**Operation Impacts.** For the anticipated lifetime of the proposed facility (**approximately 35 years**), the proposed project would not create significant visual impacts at the four key viewing areas

(KVAs) because the new facilities would blend visually with the existing power plant facilities. Trees, such as cottonwoods, poplars, and alders, would be planted along the south bank of the Truckee River to screen portions of the proposed facility. It should be noted, however, that these trees are shorter than the planned development; when mature, the trees would provide screening only for the lower 9-12 meters (30-40 feet) of the project. Those portions of the proposed Piñon Pine Power Project that lend themselves to painting would be painted in earth-tones. The exception to this practice would be to use appropriate highlighting colors (yellow and red) for areas that require special attention for health or safety reasons. Structural steel would be left a silver/grey color to blend in with existing Tracy Power Station facilities. Noise during operations (including noise associated with the flare) is discussed in section 4.1.11.

An emergency flare system would be incorporated into the plant design to incinerate the full product gas flow from the gasifier during gasifier start-up and during scheduled and unscheduled outages. The calculated total emissions of NO<sub>x</sub>, CO, VOC, SO<sub>x</sub> and PM<sub>10</sub> from this flare would not be expected to exceed 0.81 tons per year. The flare would be a vertical free-standing system that would allow condensed moisture to be drained from the fuel vent line. The flare stack would extend 7.5 meters (25 feet) above grade. EPA has requirements for flare system operation (40 CFR 60.18), and requires that flare opacity emissions must not be visible more than 5 minutes during any 2 consecutive hour period when the system is operational. Flare opacity emissions from the proposed project would not significantly impact the area's visual resources. The coal gas fuel would produce a flame of low brilliance. The flame would be a dull yellow because of the large amounts of carbon monoxide (CO) in the fuel gas. The emissivity of the flame is expected to be 0.05, compared to 0.35 for a hydrocarbon flame. During operation, the flame of the proposed flare system would be visible from all KVAs, especially at night. Full capacity fuel combustion in the flare would result in a flame 1.8 meters (6 feet) in diameter and 12 meters (40 feet) in height. Because the flare would be used intermittently (approximately 3 to 4 times per year) and the fuel gas flame is of very low brilliance, when compared to plant and stack lighting, the incremental impact on visual resources would not be significant.

### **4.1.2 Atmospheric Conditions**

This section describes the construction and operation impacts to air quality, visibility, acid deposition, and global climatic change from the proposed Piñon Pine Power Project.



#### **4.1.2.1 Air Quality**

**Construction Impacts.** Impacts on air quality from construction of the proposed Piñon Pine Power Project would be short-term with no adverse impacts anticipated. Atmospheric effects during construction would occur intermittently during a 26-month period and be limited primarily to impacts associated with construction equipment used for site preparation and exhaust emissions from construction and employee vehicles. Minor source growth in the air basin from construction of the proposed Piñon Pine Power Project would not be expected to be significant because of the proximity of services in the Reno/Sparks area.

Localized emissions generated would include CO, oxides of nitrogen (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>), particulates (PM<sub>10</sub>), and hydrocarbons. Estimates of total construction emissions are presented in Table 4.1.2-1, and are divided into employee-related and construction vehicle emissions, as well as anticipated particulate matter emissions resulting from site grading. Anticipated emissions have been projected for the 26-month construction period. Estimates for motor vehicle emissions are based on the assumption that the required 350 construction employees would live in the Reno/Sparks area and travel 56 km (35 miles), with each person driving separate vehicles for a work schedule consisting of 5-days a week, 52 weeks per year for the entire 26-month construction period. During construction, freight would be delivered to the site using heavy duty trucks. For the purpose of estimating emissions, it was assumed that a total of three material/equipment deliveries would be required per day during the construction period, and the total number of vehicle miles traveled per year would be 1,092 (1,757 km). Section 4.1.5.3 on transportation explains that the overall increase in average daily traffic for the area during the construction phase would be less than 3 percent.

Initial site grading for the proposed Piñon Pine Power Project would disturb approximately 17 acres of the Tracy Power Station for a period of 3 months. A complete description of the construction area and setting is presented in section 4.1.1. SPPCo. submitted the Nevada Division of Environmental Protection (NDEP) permit concerning surface area disturbance in the summer of 1993. Fugitive particulate emissions would be generated from vehicles traveling on unpaved roads and dirt and during periods of earth removal and transport by construction vehicles. Because most of the proposed site currently is barren, much less site clearing would be necessary than for an undisturbed site. Fugitive emissions would also occur from loosened earth being lifted and blown by strong winds. Fugitive dust consists primarily of large particles that settle quickly and pose minimal adverse public health effects. As a mitigation measure, fugitive dust emissions would be minimized during construction by water application as necessary.

Table 4.1.2-1. Estimated construction emissions in tons per year.

Pollutant	Total Hydrocarbons (THC)	CO	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>
Construction Personnel Vehicle Emissions	6.4	71.3	13.2	N/A	3.0
Construction Truck Traffic Emissions	0.32	3.8	1.23	0.31	0.06
Construction Equipment Emissions	4.0	25.6	61.5	6.5	4.5
Site Grading Emissions	N/A	N/A	N/A	N/A	30.6
Total Annual Construction Emissions (First Year)	10.72	100.7	75.93	6.81	38.16
Total Construction Emissions	23.2	218.2	164.5	14.8	47.0*

N/A: Not Applicable

*\*Assumes all site grading occurs during the first year of construction.*

**Operation Impacts.** Ambient air quality impacts are characterized and implemented under the Clean Air Act (CAA) by means of the National Ambient Air Quality Standards (NAAQS) and the Prevention of Significant Deterioration (PSD) increments. As was stated in section 3.2.1, NAAQS are fixed, absolute limits established by EPA for concentrations of the "criteria" pollutants [SO<sub>2</sub>, NO<sub>2</sub>, PM<sub>10</sub>, CO, ozone (O<sub>3</sub>), and lead (Pb)] in the ambient air. The purpose of NAAQS is to protect public health and the environment with an adequate margin of safety by establishing a ceiling for ambient pollutant concentrations resulting from the combination of new sources (e.g., the Piñon Pine Power Project), existing sources (e.g., Tracy Power Station Units 1, 2, and 3), and natural sources of air emissions in an area.

Although the CAA Amendments of 1970 provided a plan to address emissions in areas of the country where pollution levels exceeded the NAAQS, the CAA did not contain explicit provisions addressing potential deterioration of ambient air quality in those areas where pollutant levels were below the NAAQS. In 1977, Congress established provisions requiring states with areas that are in compliance with the NAAQS to adopt a permit program for the preconstruction review of new stationary sources and modification of existing stationary sources to prevent significant deterioration of existing air quality levels.

The PSD program mandated by Congress is required to balance three primary goals, as specified by section 160 of the CAA. The first of these goals is to protect public health and welfare through the protection of existing air quality in all areas where ambient pollutant concentrations required by the NAAQS are currently being achieved or have not been classified. The second goal emphasizes the protection of air quality in national parks, wilderness areas, and similar areas of special concern where the protection of air quality is considered particularly important. The third goal is to assure that economic growth in clean air areas occurs only after careful deliberation of the impacts of growth on air quality by the state and local communities, and only when such growth would be consistent with the preservation of clean air resources.

The proposed Piñon Pine Power Project is considered to be a modification of an existing source because it would be located on property contiguous to existing Tracy Power Station facilities. A modification is subject to PSD requirements (40 CFR 51.166) if the modification alone would constitute a major source. The proposed power plant would meet the definition of a "major stationary source" because it would be a fossil fuel-fired steam electric plant with more than 250 MMBtu/hr input and would emit more than 100 tons per year of regulated air pollutants. The proposed project would consist of 20 individual point sources. These sources are listed in Table 4.1.2-2 with bullets indicating *estimated emissions*. *Additional* projected emission rates and exhaust characteristics for these sources are described in the Air Quality Technical Report *and the PSD permit applications*, which *are* available in the reading rooms (see Appendix H). To determine which emissions from the Piñon Pine Power Project have the potential to significantly impact air quality, air emissions were compared with the PSD significant emission rates [threshold values for ambient air quality monitoring requirements contained in 40 CFR 52.21(b)(23)]. Table 4.1.2-3 presents a comparison of the significant emission rates and the proposed project emissions. Air emissions expected during operation of the proposed Piñon Pine Power Project include 225 tons per year of SO<sub>2</sub>, 123 tons per year of PM<sub>10</sub>, 575 tons per year of NO<sub>x</sub>, and 304 tons per year of CO. These were the only pollutants with emission rates greater than the PSD significant

**Piñon Pine Power Project**

**Table 4.1.2-2. Proposed Piñon Pine Power Project air emission points.**

Source	Lbs/Hr.			
	NO <sub>x</sub>	SO <sub>2</sub>	CO	PM <sub>10</sub>
Combustion Turbine/Heat Recovery Steam Generator	141	15.4	34.4	20.0
Sulfation Combustor	3.8	37.5	37.5	3.8
Start-up Heaters	2.73	0.014	0.68	0.10
Coal Dryer	0.53	0.0032	0.11	0.80
Flare	3.57	0.012	0.48	0.06
Cooling Tower				0.11
Feed Lockhopper Vent				0.135
Feed Surge Bin Vent				0.005
Limestone Feed Hopper Vent				0.005
Raw Coal Storage <i>Dome</i>				1.37
Coal Preparation Area Vent				1.71
Coal Day Bin Storage Silo Vent				0.34
Coke Storage Silo Vent				0.34
Lime Storage Silo Vent				0.34
Solid Waste Storage Silo Vent				0.34
Coal Unloading Area Vent				2.14
<i>Gasifier Feed Vent</i>				0.86
<i>Waste Water Cooling Tower</i>				0.50
<i>Sulfator Depressurization Vent</i>				0.10
<i>Sorbent Storage Vent</i>				0.0003

emission rates. All other pollutants were determined to be below the PSD significant emission rates, and therefore, do not have the potential to significantly impact air quality in the attainment area.

**Table 4.1.2-3. Comparison of proposed Piñon Pine Power Plant emissions and significant emission rates.**

Pollutant	Emissions (TPY)	Significant Emission Rate (TPY)
SO <sub>2</sub>	225	40
PM <sub>10</sub>	123	15
NO <sub>x</sub>	575	40
CO	304	100
Volatile organic compounds	25.7	40
Pb	0.01	0.6
Sulfuric acid mist	6.4	7.0
Total fluorides	0.18	3.0
(in tons per year)		

**Preliminary Impact Analysis**

Air quality impacts from the proposed Piñon Pine Power Project were evaluated using EPA-approved atmospheric dispersion models. A dispersion model is a computer program that incorporates a series of mathematical equations for predicting ground-level concentrations resulting from emissions of a pollutant. Inputs to a dispersion model include the emission rate; characteristics of the emissions release such as stack height, exhaust temperature, and flow rate; and atmospheric dispersion parameters such as wind speed and direction, air temperature, atmospheric stability, and mixing height.

A Good Engineering Practice (GEP) stack height analysis was performed in accordance with EPA's Guideline for Determination of Good Engineering Practice Stack Height (EPA, 1985). *This analysis was revised to incorporate design modifications.* All existing and proposed units at the Tracy Power Station were evaluated for the potential and extent of aerodynamic downwash caused by nearby structures. Any structures made of steel frames were conservatively assumed to be solid structures. A complete description of the GEP analysis is provided in section 6.2 of the Air Quality Technical Report

*and the [PSD] Application for Permit to Construct, Revisions 1 and 4*, available in the reading rooms (see Appendix H).

EPA (1990b) separates the dispersion modeling analysis into two distinct phases: (1) the preliminary analysis, and (2) a full impact analysis. The results of the preliminary analysis are used to determine the significant impact area of each pollutant, and determine which criteria pollutants require a full impact analysis. The EPA does not require a full impact analysis for a particular pollutant if the results of the preliminary analysis indicate the emissions from the proposed source or modification would not increase ambient concentrations by more than the prescribed significance levels. A full impact analysis is required for any pollutant for which estimated ambient pollutant concentrations attributable to the proposed source or modification are greater than the significance levels.

Both the preliminary and the full impact modeling assessments of the proposed Piñon Pine Power Project were performed using progressively more sophisticated models. Initial screening runs were conducted with the Industrial Source Complex Short-Term (ISCST2) and COMPLEX-1, as combined in the Integrated Gaussian Model (IGM) (EPA, 1986a). Pollutants for which upper limit estimates were higher than the corresponding standards then were modeled using the refined analytical model, Complex Terrain Dispersion Model Plus Algorithms for Unstable Situations (CTDMPLUS) (Perry *et al.*, 1990). For the CTDMPLUS analysis, only those areas where the IGM failed to show compliance with the NAAQS or PSD increment were modeled. *CTDMPLUS is a refined air quality model that is preferred for use in all stability conditions for complex terrain applications. It is particularly applicable to the Tracy site because data collected during field experiments at the site in 1983 and 1984 were used in developing the model. The modeling analysis for the proposed project incorporated two years of meteorological data collected at the Tracy monitoring site, including periods of wintertime inversions and stagnant air masses. The effects of local topography were incorporated through the use of input data files, containing digitized representations of surrounding terrain, so that the aerodynamic effects of hills, ridges, etc. would be incorporated in predicted project impacts as well.* A complete description of these models is provided in section 6.0 of the Air Quality Technical Report, available in the reading rooms (see Appendix H).

The complete inventory of proposed Piñon Pine Power Project emission sources was modeled using IGM to determine the maximum ambient pollutant impact and the extent of the *maximum* significant impact area for CO, PM<sub>10</sub>, and SO<sub>2</sub>. The significant impact area for NO<sub>2</sub> was determined using the *ozone* (O<sub>3</sub>) limiting method which required the inclusion of the existing Tracy sources in the

analysis. A thorough discussion of the use of the *ozone* (O<sub>3</sub>) limiting method can be found in Appendix C.

The predicted maximum impacts from the proposed Piñon Pine Power Project are shown in Table 4.1.2-4. The maximum predicted CO and NO<sub>2</sub> impacts are less than the significance levels. As such, no additional analysis is required to demonstrate compliance with the applicable ambient air quality standards and PSD increments. The maximum predicted PM<sub>10</sub> and SO<sub>2</sub> impacts, however, were determined to be greater than the significance levels. Therefore, a full impact analysis including the effects of PM<sub>10</sub> and SO<sub>2</sub> emissions from other nearby sources was performed to demonstrate compliance with the applicable ambient air quality standards and PSD increments. The significant impact area for each pollutant was conservatively defined as a circular area with a radius equal to the greatest distance to which modeled impacts from the proposed source are significant. The significant impact areas for PM<sub>10</sub> and SO<sub>2</sub> were determined to have a radius of 4.6 and 5.9 kilometers (2.9 and 3.7 miles), respectively. A complete description of the preliminary impact analysis is provided in section 7.2 of the Air Quality Technical Report available in the reading rooms (see Appendix H).

#### Prevention of Significant Deterioration

The principal air quality protection mechanism under the PSD program involves a system of increments and area classifications that effectively define "significant deterioration" for individual pollutants. The CAA divides PSD areas into three area classes and applies increments of different stringency to each class. Class I areas include international parks, national wilderness areas, memorial parks larger than 5,000 acres, and national parks larger than 6,000 acres. Less restrictive increments apply in areas identified as Class II. Class II areas are designated for moderate well-controlled industrial growth. The Class III area designation allows states to permit increased deterioration in air quality in specific areas which may be targeted for higher levels of industrial development and consequent growth in pollution (to date, no state has established a Class III area). The proposed Piñon Pine Power Project would be located in a Class II PSD area. However, PSD increment consumption must, at a minimum, be determined for all Class I areas within 100 km (62 miles) of the proposed sources. The only Class I area within 100 km (62 miles) of the Tracy facilities is the Desolation Wilderness Area, located 81.3 km (51 miles) southwest of the proposed project site. DOE has contacted the U.S. Forest Service's Air Resource Specialist for the Desolation Wilderness Area to discuss relevant impacts of the proposed project. *Class I national park areas in California are more than 100 km (62 miles) from the proposed project site (e.g., Lassen Volcanic National Park is 200 km (124 miles) away, Yosemite National Park*

Table 4.1.2-4. Predicted impacts from the proposed Piñon Pine Power Project.

Pollutant	Averaging Period	Significance Levels ( $\mu\text{g}/\text{m}^3$ )	Maximum Concentration ( $\mu\text{g}/\text{m}^3$ )	Extent of Significant Impact Area (km)
CO	1-hr	2,000	125.9	< SL <sup>1</sup>
	8-hr	500	44.7	< SL
NO <sub>2</sub>	Annual	1	0.9	< SL
PM <sub>10</sub>	24-hr	5	15.4	4.6
	Annual	1	1.1	3.0
SO <sub>2</sub>	3-hr	25	65.8	5.9
	24-hr	5	12.9	5.9
	Annual	1	2.0	5.0

<sup>1</sup>Significance level.

Note: No significance level has been established for ozone. Instead, for any net emissions increase of 100 TPY of VOC subject to PSD, an ambient impact analysis must be performed. Table 4.1.2-3 identifies the proposed project's emissions for VOCs to be 25.7 TPY and, therefore, no analysis was required.

is 214 km (133 miles) away, Lava Bed National Monument is 322 km (200 miles) away, King's Canyon National Park is 327 km (203 miles) away, and Point Reyes National Seashore is 338 km (210 miles) away.

A PSD "increment" is the maximum increase in concentration that is allowed to occur above a baseline concentration for a pollutant. A pollutant's baseline level is established by EPA or the environmental agency having jurisdiction in the area. The NDEP is delegated authority by the EPA to administer air quality regulations for all counties in Nevada, with the exception of Clark and Washoe Counties. Significant deterioration is determined to occur when the ambient impact of emissions from new sources exceeds the applicable PSD increment. The NDEP is currently reviewing SPPCo.'s PSD permit application. SPPCo. anticipates the public notice of intent will be issued in August with final approval of the permit to construct by December 1994. *(The PSD permit application, with revisions, is available in the reading rooms listed in Appendix H.)*

The first step in performing the PSD increment analysis required establishing the baseline air quality in the project area. Emission sources which predate the establishment of PSD increments such as the existing Tracy Power Station Units 1, 2, and 3 were considered part of the baseline air quality. Next, NDEP and Washoe County provided the list of sources proposed or constructed after the baseline. All proposed Piñon Pine Power Project sources were included in this list. Finally, the cumulative impact of these listed sources was determined using the air quality models described previously. The results of the analysis for the Class II area are provided in Table 4.1.2-5. The *cumulative* incremental impacts are shown in the table along with the Class II PSD increment for comparison. *The proposed Piñon Pine Power Project's contribution to the consumption of the annual Class II PSD Increment for SO<sub>2</sub> would be 10 percent; its contribution to consumption of the 24-hour increment would be 14 percent; and it would not contribute appreciably to consumption of the 3-hour increment. The proposed Piñon Pine Power Project would be the sole contributor to the consumption of the annual Class II PSD increment for PM<sub>10</sub> and the major contributor for the 24-hour increment's consumption. The cumulative impact of all the listed sources as shown in Table 4.1.2-5 is less than the PSD increment for all pollutants. These projected results are based on worst case operating scenarios and thus, should not reduce opportunities for additional growth within the limits of the air quality protection requirements of the PSD program. Therefore, the addition of the proposed Piñon Pine Power Project would not result in significant air quality degradation in the project area. The control technology requirements of the PSD regulations require Best Available Control Technology (BACT) be applied to control emissions from the source. A summary of the BACT analysis is presented in section 4.3.2.1.*

Table 4.1.2-5. Modeling results for PSD Class II increment consumption.

Pollutant	Averaging Period	Cumulative Impact ( $\mu\text{g}/\text{m}^3$ )	Class II Increment ( $\mu\text{g}/\text{m}^3$ )	Percentage of Increment Consumed
SO <sub>2</sub>	Annual	2.19	20	10.9
	24-hour	13.5	91	14.8
	3-hour	66.2	512	12.9
PM <sub>10</sub>	Annual	2.04	17	12
	24-Hour	17.1	30	57

Table 4.1.2-6. Modeling results for PSD Class I increment consumption.

Pollutant	Averaging Period	Additional Impact ( $\mu\text{g}/\text{m}^3$ )	Class I Increment ( $\mu\text{g}/\text{m}^3$ )	Percentage of Increment Consumed
SO <sub>2</sub>	Annual	0.004	2	0.2
	24-hour	0.02	5	0.4
	3-hour	0.14	25	0.6
PM <sub>10</sub>	Annual	0.001	4	0.03
	24-hour	0.02	8	0.25
NO <sub>2</sub>	Annual	0.003	2.5	0.12

The results of the Class I PSD increment analysis are presented in Table 4.1.2-6. The Class I modeling analysis was performed using a grid of 13 receptors along the eastern edge of the Class I area (Desolation Wilderness Area) closest to the proposed project site. As the table shows, operation of the proposed Piñon Pine Power Project would result in the consumption of no more than 3/5 of 1 percent of a PSD Class I increment. This information has been communicated by DOE to the U.S. Forest Service, which will make a final determination of potential impact after reviewing SPPCo.'s PSD permit application. The additional ambient impact of the sources were in compliance with the allowable Class I PSD increments as well. Because Jarbridge Wilderness Area, *Lassen Volcanic National Park*, *Yosemite National Park*, *Lava Bed National Monument*, *King's Canyon National Park*, *Point Reyes National Seashore*, and the Grand Canyon National Park are even further away, no impacts to these areas are expected. Class I and Class II PSD increment analyses are discussed in section 9.0 of the Air Quality Technical Report (*and PSD permit applications*), available in the reading rooms (see Appendix H).

#### Ambient Air Quality Analysis

An NAAQS analysis was performed for PM<sub>10</sub> and SO<sub>2</sub> (CO and NO<sub>2</sub> were less than the significance levels). EPA (1990b) requires that all "nearby" sources be explicitly modeled as part of the ambient air quality modeling analysis. "Nearby" is defined by the Guideline on Air Quality Models (EPA, 1987c) as any point source expected to cause a significant concentration gradient in the vicinity of a proposed new source or modification. All existing Tracy Power Station and proposed Piñon Pine Power Project units were included in this inventory. A listing of approximately 1,900 PM<sub>10</sub> and SO<sub>2</sub>

sources in Nevada was provided by the NDEP. Additional sources provided by Washoe County were added to this inventory. The complete inventory is presented in Appendix E of the Air Quality Technical Report, available in the reading rooms (see Appendix H). Information contained in this inventory was used to eliminate sources from further analysis using the "North Carolina Screening Threshold" method (*State of North Carolina, 1985*). A total of 15 PM<sub>10</sub> and 8 SO<sub>2</sub> sources had potential emissions greater than the North Carolina screening threshold emission rate.

An initial modeling analysis for PM<sub>10</sub> using the IGM was conducted for receptors out to 7 km (4.3 miles) from the Tracy Power Station [beyond the significant impact area, which extends to 4.6 km (2.9 miles)]. A second modeling analysis was performed using a fine receptor grid (100-meter (328-feet) spacing) in those areas where the predicted values from the initial run were at least 75 percent of the ambient air quality standard.

The results of the refined IGM run for PM<sub>10</sub> emissions are presented in Table 4.1.2-7. There are no predicted exceedances of the PM<sub>10</sub> standards for which the Piñon Pine Power Project would have a significant contribution; the model was conservative and could be overpredicting these ambient levels.

The initial screening level modeling analysis for SO<sub>2</sub> using the IGM was conducted for receptors out to 7 km (4.3 miles) from the Tracy Power Station [slightly beyond the *maximum* significant impact area which extends to 5.9 km (3.7 miles)]. The IGM results indicate that predicted impacts in some complex terrain areas (from the COMPLEX-I component of IGM) are above the ambient standards. *Areas where the total of the IGM predictions and*

**Table 4.1.2-7. Peak IGM model predictions for total PM<sub>10</sub> impacts<sup>1</sup>.**

Averaging Period	Concentration <sup>2</sup> ( $\mu\text{g}/\text{m}^3$ )	Ambient Standard ( $\mu\text{g}/\text{m}^3$ )
Annual	42.9	50
Daily	127.3	150

<sup>1</sup>For which the Piñon Pine project has a significant contribution.  
<sup>2</sup>Includes a regional background concentration of 16  $\mu\text{g}/\text{m}^3$  for annual averages, and a 24-hour value based on monitored data from the modeling period month and date.

*regional background exceeded any ambient SO<sub>2</sub> standard were selected for refined CTDMPPLUS modeling.* The peak CTDMPPLUS 3-hour, 24-hour, and annual predictions were 1,121, 308, and 52  $\mu\text{g}/\text{m}^3$ ; respectively (see Table 4.1.2-8). These values are well below the ambient standards for SO<sub>2</sub>. A complete discussion of the ambient air quality modeling analysis is provided in section 10 of the Air

Quality Technical Report and the [PSD] Application for Permit to Construct (with revisions), available in the reading rooms (see Appendix H).

*For the proposed trial burn demonstration (high-sulfur eastern coal), the only pollutant emission rate that would increase over that of the design coal case would be SO<sub>2</sub> emissions from the sulfation combustor stack. As an upper limit, a total proposed project emission rate of about 0.5 lb/MMBtu of SO<sub>2</sub> is assumed for the trial burn. The resulting emission rate for the sulfation combustor would then be 406.3 lb/hr. The remainder of the entire SO<sub>2</sub> emission inventory would be identical to that of the design coal case. Results of the CTDMPLUS run with the densely-spaced receptors indicate that the short-term demonstration project's emissions would be in compliance with ambient SO<sub>2</sub> standards. This short-term trial burn would not significantly affect the annual average. Results from the initial CTDMPLUS run showed that even if the trial burn lasted a full year, the predicted annual average (63 µg/m<sup>3</sup> from CTDMPLUS plus 13 µg/m<sup>3</sup> as a conservative background) would still be in compliance with ambient SO<sub>2</sub> standards.*

#### Nonattainment Area Impacts

The Truckee Meadows Air Basin (Air Basin 87) is currently classified as a moderate nonattainment area for CO and PM<sub>10</sub>; Washoe County is a marginal nonattainment area for O<sub>3</sub> (see section 3.2.1). The preliminary impact analysis indicated that the maximum ambient impact of CO emissions from the proposed Piñon Pine Power Project would be less than the significance level for both averaging periods (1 hr and 8 hr). The preliminary analysis for PM<sub>10</sub> emissions identified significant impacts at a maximum distance of 4.6 km (2.9 miles). Based on this analysis, the proposed Piñon Pine Power Project would not have a significant impact on ambient concentrations of either nonattainment pollutant in the Truckee Meadows.

The only pollutant of concern for the Washoe County nonattainment area is the O<sub>3</sub> precursor NO<sub>2</sub> (emissions for volatile organic compounds (VOCs) were below the significant emission rate). The preliminary impact analysis for this pollutant, utilizing the *ozone* (O<sub>3</sub>) limiting method, indicated that the maximum ambient impact of NO<sub>x</sub> emissions from the proposed Piñon Pine Power Project is less than the significance level and would not have a significant impact on the Washoe County O<sub>3</sub> nonattainment area.

**Table 4.1.2-8. Peak CTDMPPLUS predictions for total SO<sub>2</sub> impacts.**

Averaging Period	Concentration <sup>1</sup> (µg/m <sup>3</sup> )	Ambient Standard (µg/m <sup>3</sup> )
3 hours	1,121	1300
24 hours	308	365
Annual	52	80

<sup>1</sup>Includes measured ambient background concentrations.

**Conformity to State Implementation Plans**

*The proposed project site would be located on the Tracy Segment (Subbasin 83) of the Truckee River Basin, which is designated "unclassified" due to an absence of historical air quality data. Unclassified areas are treated in the same manner as attainment areas. Consequently, no action relating to a*

*conformity determination for the proposed Piñon Pine Power Project is required. (For more details on conformity determination requirements, see section 9.2 in the regulatory compliance chapter.)*

**Impacts on Pyramid Lake and Tribal Lands**

*To assess the potential for project impacts on tribal lands of the Pyramid Lake Paiute Tribe, a modeling analysis was performed to determine SO<sub>2</sub>, PM<sub>10</sub>, and NO<sub>x</sub> impacts at Wadsworth (approximately 19 km (12 miles) east of the Tracy site) and Nixon (approximately 32 km (20 miles) northeast of Tracy at the southern edge of Pyramid Lake). The modeling analysis utilized two years of meteorological data collected at the Tracy monitoring site. The meteorological data sets were representative of all four seasons and included periods of wintertime inversions. The results of the analysis are shown in Table 4.1.2-8a with EPA's significant impact levels and ambient air quality standards provided for comparison.*

*As these data indicate, the maximum predicted impacts at Wadsworth are less than 10 percent of EPA's significant impact levels and less than 0.3 percent of Nevada's ambient air quality standard. The model's maximum predicted impacts at Nixon (the more distant location) are, in most instances, even smaller. At these low concentrations, ambient air quality monitors at either location would not detect any change in ambient concentrations of these pollutants as a result of the proposed Piñon Pine Power Project (i.e., the predicted impacts are less than the detection limits of the monitors).*

Table 4.1.2-8a. Predicted air quality impacts on Wadsworth and Nixon, Nevada.

Location	Pollutant	Averaging Period	Maximum Impact ( $\mu\text{g}/\text{m}^3$ )	Significant Impact Levels ( $\mu\text{g}/\text{m}^3$ )	Ambient Air Quality Standards ( $\mu\text{g}/\text{m}^3$ )
Wadsworth	$\text{SO}_2$	3-hr	1.14	25	1300
		24-hr	0.42	5	365
		Annual	0.06	1	80
	$\text{NO}_x$	Annual	0.10	1	100
	$\text{PM}_{10}$	24-hr	0.44	5	150
		Annual	0.05	1	50
Nixon	$\text{SO}_2$	3-hr	0.53	25	1300
		24-hr	0.09	5	365
		Annual	<0.01	1	80
	$\text{NO}_x$	Annual	<0.01	1	100
	$\text{PM}_{10}$	24-hr	0.14	5	150
		Annual	0.00	1	50

Hazardous Air Pollutants

Nevada Administrative Code (NAC) sections 445.717 to 445.7205 (inclusive) address emissions of hazardous air contaminants. The Nevada State Environmental Commission amended NAC 445.717 on December 13, 1993 by adopting by reference the initial list of 189 hazardous air pollutants in *the CAA as amended in 1990 [CAA 112(b)(1)]*. Under the air toxic provisions of Title III of the CAA Amendments of 1990, sources emitting one (or more) of the 189 air toxics listed in the CAA are defined as "major" or "area" sources. A major source is a stationary source or a group of stationary sources located within a contiguous area and under common ownership or control that emits, or has the potential

to emit, 10 tons per year or more of a listed pollutant or 25 tons per year or more of a combination of listed pollutants. *In addition, NAC 445.717 imposes a rate limit of 1 pound per hour for any one of the 189 hazardous air pollutants.*

Currently, electric steam generating units greater than 25 MW are not included on EPA's source category lists (57 FR 31576, July 16, 1992). Title III requires EPA to perform a human health study of the air toxic emissions and controls for utilities and to use the results of this study as a basis for the development of a regulatory strategy. However, this human health study will not be submitted by EPA to Congress until 1995. Thus, for now, electric utilities are not affected by the air toxic provisions of Title III, but after 1995, EPA may develop control strategies for emissions which may warrant regulation. Review of the maximum hazardous air pollutants from the proposed project (i.e., chlorine), indicates maximum emission rates under *0.21 pounds per hour*, 2 tons per year of any air toxic, and an aggregate under 3 tons per year. *These values are well under the 1 pound per hour, 10 tons per year and 25 tons per year limits. In addition, trace elements and metals, including antimony, arsenic, beryllium, cadmium, chromium, lead, mercury, and selenium would be emitted in quantities well below adopted limits. A list of predicted hazardous air contaminant emissions is provided in Table 4.1.2-8b. Conservative assumptions were used (e.g., 100 percent of the trace metals would be emitted from the combustion turbine/HRSG and sulfation combustor) to develop these hazardous air contaminant emission estimates. For example, using these assumptions, the maximum 8-hour concentration of mercury from the HRSG combustion turbine would be 0.00004  $\mu\text{g}/\text{m}^3$  and the mercury concentration from the sulfation combustor would be 0.00001  $\mu\text{g}/\text{m}^3$ . Therefore, no potential future compliance issue with NAC 445.717 is seen to be of concern.*

#### Impacts on Soil and Vegetation

As stated in section 3.3.2, the pH values for soils at the proposed site are 6.5 for Saralegui-Isolde Association and 7.6 for Pits-Dumps Complex. This suggests that the level of  $\text{SO}_2$  and  $\text{NO}_x$  emissions predicted for this project would not significantly affect the Ph levels of soils within the maximum impact radius. Sulfur is a major plant nutrient and can be directly absorbed into the soil. An increase in  $\text{SO}_2$  in the soil would not be expected to have any adverse effects on vegetation. A complete discussion of the analysis performed to assess soil impacts is provided in section 11.2.1 of the Air Quality Technical Report, available in the reading rooms (see Appendix H).

4.1.2-8b. List of predicted hazardous air contaminant emissions.<sup>1</sup>

Parameter	Combustion turbine <sup>2</sup> lbs/hr	Flare <sup>2</sup> lbs/hr	Sulfation Combustor lbs/hr
Antimony	0.002	0.002	0.00014
Arsenic	0.001	0.001	0.00010
Barium	0.035	0.035	0.00289
Beryllium	0.00009	0.00009	0.00001
Boron	0.018	0.018	0.00179
Cadmium	0.0002	0.0002	0.00002
Chlorine	0.19	0.19	0.01811
Chromium	0.003	0.003	0.00023
Cobalt	0.0002	0.0002	0.00002
Copper	0.0005	0.0005	0.00004
Fluorine	0.017	0.017	0.00142
Lead	0.001	0.001	0.00009
Mercury	0.00003	0.00003	0.000002
Nickel	0.0002	0.0002	0.00002
Potassium	0.025	0.025	0.00204
Scandium	0.001	0.001	0.00015
Selenium	0.002	0.002	0.00017
Silver	0.0003	0.0003	0.00003
Thallium	0.0017	0.0017	0.00014
Titanium	0.19	0.19	0.01574
Vanadium	0.0003	0.0003	0.00003
Zinc	0.0004	0.0004	0.00004

<sup>1</sup> Based on coal and limestone analyses.<sup>2</sup> Incorporates particulate matter emission control efficiency of 99 percent.

Sulfur dioxide ( $\text{SO}_2$ ) can affect vegetation directly (as a gas) or indirectly by means of its principal reaction product sulfate (e.g., acidification of soils). In addition, a third mechanism of impact is the formulation of acid mist. Direct effects of injury can be manifested as foliar necrosis, decreased rates of growth or yield, predisposition of disease, and reduced reproductive capacity. According to the dose-injury curve for  $\text{SO}_2$ -sensitive plant species (see section 3.6.2. for a listing of plant species surveyed in the proposed area) provided by the USFWS (1978). These predicted values are applicable only when plants are growing under both the most sensitive environmental conditions and stage maturity. *In that same publication (USFWS, 1978), lists of plants by sensitivity to  $\text{SO}_2$  exposure are provided. Two species listed as "sensitive" to  $\text{SO}_2$  exposure (Bromus sp. and S. symbrium sp.) are known to occur within the radius of the area that could potentially be affected by chronic exposure. These plants are invasive weedy species with wide distribution and are not listed or considered to be sensitive because of rarity or threats to their existence (see section 3.6.2). One species listed as "intermediate" to  $\text{SO}_2$  exposure (Artemisia tridentata) is also found within the chronic exposure area. This too is a widely distributed species. Having an "intermediate" status indicates that some doubt exists regarding effects from exposure. From an average annual basis, exposure levels would be below that which plant damage occurs.* Thresholds for chronic plant injury by  $\text{SO}_2$  have been estimated at about  $130 \mu\text{g}/\text{m}^3$  on an annual average (USFWS, 1978). The maximum average annual air concentrations estimated for this project ( $2.0 \mu\text{g}/\text{m}^3$ , see Table 4.1.2-4) are far below the USFWS thresholds for chronic exposure. In addition, the maximum concentrations are not expected to extend beyond a 1,452-meter (1,588-yard) radius. Consequently, the projected concentrations of  $\text{SO}_2$  are not expected to cause visible foliar injury or significant adverse chronic effects to vegetation.

Nitrogen dioxide ( $\text{NO}_2$ ) is potentially phytotoxic, but generally at exposures considerably higher than those resulting from most industrial emissions. Exposures for several weeks to concentrations of 280 to  $490 \mu\text{g}/\text{m}^3$  can cause decreases in dry weight and leaf area, and 1-hour exposures of at least  $18,000 \mu\text{g}/\text{m}^3$  are required to cause leaf damage. The predicted maximum levels of  $\text{NO}_2$  emissions for the proposed project is  $0.90 \mu\text{g}/\text{m}^3$  (see Table 4.1.2-4), far below these threshold limits. In addition, the maximum predicted 1-hour  $\text{NO}_x$  concentration ( $9.0 \mu\text{g}/\text{m}^3$ ) would be significantly smaller than the 1-hour threshold ( $18,000 \mu\text{g}/\text{m}^3$ ) for 5 percent foliar injury to sensitive vegetation (EPA, 1991). This indicates that  $\text{NO}_x$  emissions from the facility when considered in the absence of other air pollutants would not adversely affect vegetation.  *$\text{NO}_2$ , however, has been shown to increase the level of visible injury and photosynthesis reduction in plants exposed to  $\text{SO}_2$ . Since emission levels from the proposed plant are significantly lower than concentrations of both  $\text{NO}_2$  and  $\text{SO}_2$  that would damage vegetation, no adverse*

*impacts are expected.* Further discussion of the impact assessment on vegetation is provided in section 11.2.2 of the Air Quality Technical Report, available in the reading rooms (see Appendix H).

### **Secondary Emissions**

For the purpose of estimating secondary operational emissions, it was assumed that all of the 25 new employees required for the Piñon Pine Power Plant would be employed from the Reno/Sparks area, with a round trip distance of 113 km (70 miles). The vehicles used in the emissions estimate were mostly late model cars and pickup trucks, with a few earlier model (1980) vehicles. The employees were assumed to work 365 days per year. It also was assumed that during normal operation of the project, trucks would be delivering limestone and miscellaneous consumables (such as solvents, lubricating oil, and parts) and would require four deliveries per day (or 1,228 truck trips per year); 578 km (359 miles) per round trip was assumed. Combustion waste (LASH) would be removed in quantities of approximately 50 truckloads per week, with each trip estimated to be 161 km (100 miles) in travel distance.

The emissions associated with rail transport were determined by estimating locomotive engine emissions and in-transit railcar dust loss. (In-transit dust loss is a result of the effects of the wind on the coal.) Approximately 90 percent of the fugitive emissions created from in-transit dust loss usually occurs within 97 km (60 miles) of initial coal pickup. A dust suppressant would be applied to the loaded railcars (with an assumed control efficiency of 50 percent). Because potential sources (e.g., vehicles and railcars) would not be stationary, emissions would not likely be concentrated in the project area; consequently, secondary emissions would be expected to result in negligible impacts. Table 4.1.2-9 presents the calculations for annual secondary operational emissions resulting from the proposed Piñon Pine Power Project.

#### **4.1.2.2 Visibility**

**Construction.** Impacts on visibility from construction of the proposed Piñon Pine Power Project would be short-term with no adverse impacts anticipated. Fugitive particulate emissions would be generated from vehicles traveling on unpaved roads and dirt and during periods of earth removal and transport by construction vehicles. Fugitive emissions would also occur from loosened earth being lifted and blown by strong winds. As a mitigation measure, fugitive dust emissions would be minimized during construction by water application, as necessary.

Table 4.1.2-9. Estimated annual secondary operational emissions in tons per year.

Pollutant	Total Hydrocarbons (THC)	Carbon Monoxide (CO)	Oxides of Nitrogen (NO <sub>x</sub> )	Sulfur Dioxide (SO <sub>2</sub> )	Particulates (PM <sub>10</sub> )
New Employee Personnel Vehicle Emissions	0.6	7.2	1.3	N/A	0.3
Operational Truck Traffic Emissions	1.2	13.9	4.5	3.9	0.2
Locomotive Engine Emissions	18.8	107.5	221.8	38.3	16.8
In-Transit Railcar Dust Loss	N/A	N/A	N/A	N/A	19.6
Projected Operational Emissions	20.6	128.6	227.6	42.2	36.9

**Operations.** A visibility impact analysis was performed for both the area surrounding the proposed facility and the nearest Class I area (Desolation Wilderness). The Class II visibility impairment analysis was performed using the VISCREEN model and assessed the impacts of the NO<sub>x</sub> and PM<sub>10</sub> emissions from all proposed Piñon Pine Power Project emission sources. The results of the *Class II* analysis indicate that the proposed Piñon Pine Power Project emission of NO<sub>x</sub> and PM<sub>10</sub> would not result in a plume detectable against the background sky beyond 5 km (3.1 miles), downwind. The analysis showed that at 5 km (3.1 miles) the plume perceptibility parameter is only slightly greater than the detection limit of 2.0 and plume contrast is below the detection limit of  $\pm 0.05$ ; each decreases rapidly with distance. The neutral meteorological conditions evaluated would be applicable only to early morning and evening periods. During the day when the atmosphere is unstable, the plume from the proposed project would not be detectable at closer distances. *Wadsworth, Nixon, and Pyramid Lake are approximately 30 km (19 miles) from Tracy at the closest point. Therefore, the plume from the proposed Piñon Pine Power Project stack should not be visible to tourists at any point surrounding Pyramid Lake.*

The Class I visibility analysis was performed using Reno meteorological data and EPA prescribed inputs for background visual range and ambient  $O_3$  concentration. Like the Class II visibility analysis, the EPA model VISCREEN was used to assess impacts of both the existing Tracy Power Station and the proposed Piñon Pine Power Project. The results of the analysis indicated that the visual impacts would be below the screening criteria for all impact categories and that the plumes from the existing sources plus the proposed source would not cause significant visual impacts in the Desolation Wilderness or other scenic areas (e.g., Lassen Volcanic National Park, Yosemite National Park, Grand Canyon National Park) located further away. A complete description of the visibility impact analysis for both areas is provided in Appendix D.

*At the request of the U.S. Forest Service, the Class I visibility analysis was re-evaluated using a value for background visual range which was actually measured in the Desolation Wilderness Area. The background visual range provided by the Forest Service was more than four times more conservative than the default values recommended by EPA guidance. However, the visual impacts analysis still indicated that sources from existing Tracy facilities were, and proposed Piñon Pine Power Project facilities would be, below the screening criteria for all impact categories.*

Fog formation is a function of ambient temperature and humidity. When humidity is low (as is usual for the Reno area), fog is less than in other parts of the country. However, there would be a remote possibility that, as a result of the proposed project, there may be some occasional increase in the production of fog in the canyon during cold weather. The NDOT, in cooperation with SPPCo., already has posted warning signs in the canyon in order to mitigate any potential problems generated by natural sources. These warning signs are consistent with mitigation measures used in other areas prone to occasional fog along I-80 (e.g., the Nightingale Exit east of Tracy Station). *To assess the potential impact of the proposed Piñon Pine Power Project sources on fog formation in the vicinity of Tracy Station facilities, a modeling analysis was performed using EPA and EPRI (Electric Power Research Institute) computer models. These models were used in conjunction with water vapor emissions data for all potential fog sources in the vicinity of the Tracy site including natural bodies of water such as the Truckee River, existing Tracy facilities such as cooling towers and cooling ponds, and proposed sources such as the Piñon Pine cooling tower and evaporation pond. Figure 4.1.2-1 shows the area potentially impacted by fog (between Lockwood and Wadsworth) and the potential sources of fog on and near the proposed project site. The analysis was performed using meteorological data collected over a two year period (1992 and 1993) at the Tracy monitoring site described previously in section 3.2. The results of the analysis indicated that the addition of the proposed Piñon Pine Power Project would*

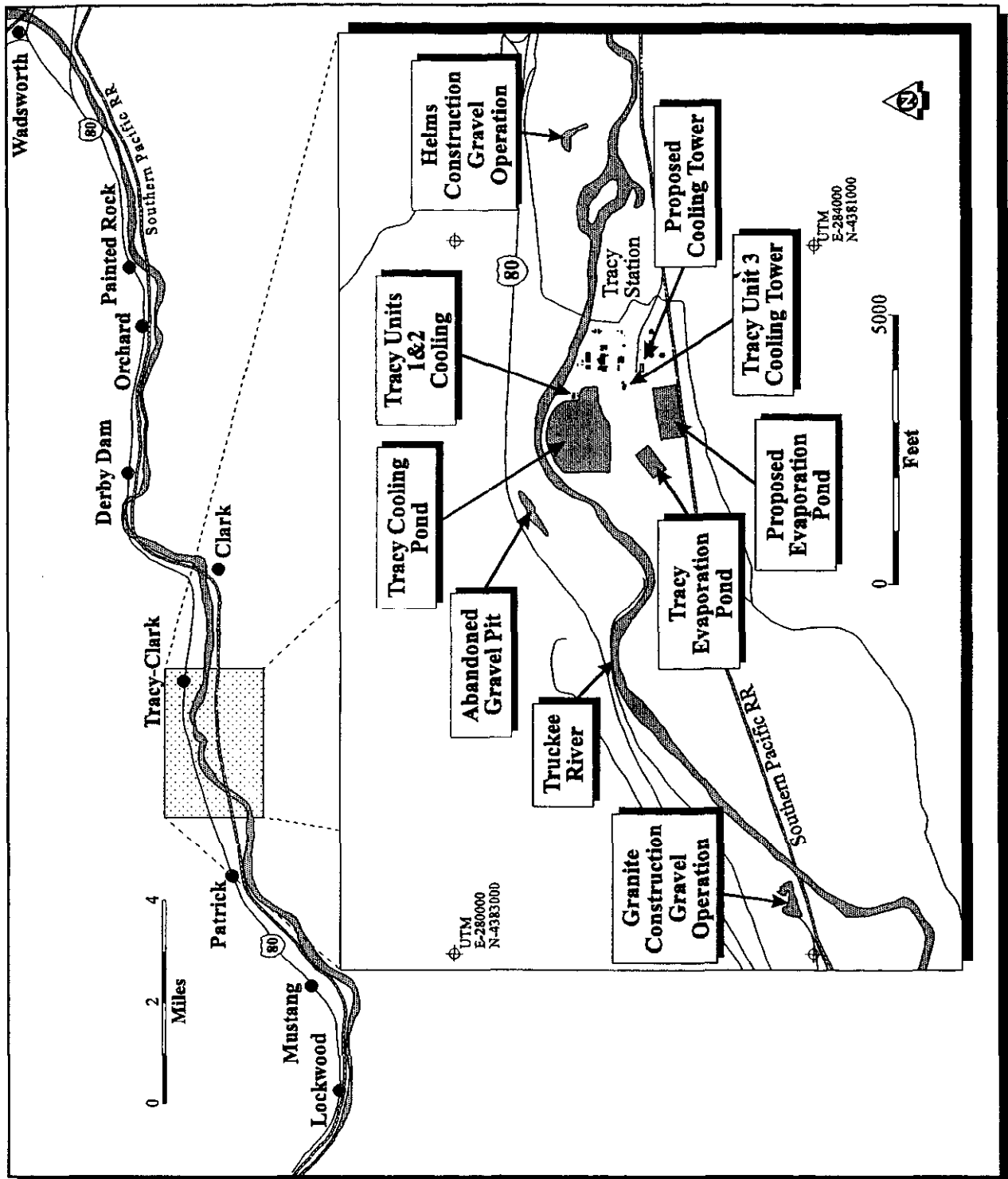


Figure 4.1.2-1. Map of lower Truckee River Canyon where fog may occur with potential sources of fog.

result in an incremental increase in annual fog hours of only 3 percent. A complete description of the analysis is provided in Appendix D1.

#### 4.1.2.3 Acidic Deposition

*Acid deposition, more commonly known as "acid rain", has become a subject of much study in recent years. Acid deposition starts with emissions of sulfur and oxides of nitrogen that are transformed in the atmosphere into acidic compounds known as "nitrates" and "sulfates". The nitrates and sulfates may return to the earth in conjunction with rain or snow — a process known as "wet deposition". Alternatively, the compounds may be deposited as gases, fog and cloud droplets, or particles; this process is known as "dry deposition". Deposition of either type may occur close to the source of the initial emissions, or the acidic compounds may be transported over long distances before being deposited. The effects of deposited sulfates may differ from the effects of nitrates, so distinction between the effects of the two compounds is made in the sections that follow.*

##### Background on Acid Deposition

*When oxides of sulfur and nitrogen are emitted into the atmosphere, chemical reactions take place which transform these oxides into other chemical forms. Sulfur dioxide ( $\text{SO}_2$ ) is transformed into the sulfate ( $\text{SO}_4^{2-}$ ) which becomes sulfuric acid ( $\text{H}_2\text{SO}_4$ ) when it combines with hydrogen. Oxides of nitrogen ( $\text{NO}$  and  $\text{NO}_2$ , known jointly as  $\text{NO}_x$ ) form several compounds: they contribute to the formation of ozone ( $\text{O}_3$ ) and particulate matter, or may form the nitrate ion ( $\text{NO}_3$ ) which becomes nitric acid ( $\text{HNO}_3$ ) when it combines with hydrogen. The effect of deposited acid compounds depends, in part, on the material or substance upon which they are deposited (called the "receptor"). Depending upon their own chemical makeup, different soils or different bodies of water will have different response or reactions to acidic inputs. Soils with a very alkaline character have greater buffering capability, meaning that their alkalinity offsets or neutralizes the acid. Soils with lower alkalinity are more susceptible to acid, and may suffer greater damage. The sensitivity of a receptor can often be predicted based upon its geographic characteristics. For example, soils at high altitudes tend to be more shallow and less alkaline than soils at lower altitudes.*

### Acid Deposition in Northern Nevada

Western Acid Deposition. Nevada and other western states receive much less attention than the eastern states in studies of acid deposition, largely because the problem is less severe in the West. Not only does the West have less precipitation, its precipitation is less acidic in character. The deposition of sulfate ions is roughly four times greater in the eastern United States than in the West, and nitrate deposition is approximately three times higher in the East. Eastern states receive roughly twice the precipitation of western states, and the deposition of hydrogen ions is approximately ten times greater in the East than in the West. This ten-fold greater deposition rate of hydrogen cations suggests that the pH of precipitation in the East should be roughly one unit lower on the pH scale than western precipitation. In fact, the median pH of precipitation in the West is roughly 5.1 or 5.2 whereas precipitation in the East commonly has a pH of approximately 4.3. Because of its arid climate, Nevada receives even less precipitation than other western states. Thus, wet deposition rates are accordingly lower.

Potential Receptors. The acid deposition effects of the proposed project depend on the prevailing wind patterns at the site of the facility. Figure 4.1.2-2 depicts the wind patterns over the Reno-Sparks area using a "wind rose" centered at Reno airport, which are more indicative of regional transport than the local meteorology in the Truckee River Canyon. Each petal of the rose indicates the wind direction (origin) and the strength of the wind. Winds originate along the arc from the south to the northwest with the strongest winds blowing from the northwest. The prevailing wind pattern is away from California and the Lake Tahoe area toward central and north-central Nevada.

The character of the receptors is also important to understanding the magnitude of the effect of acidic inputs. The primary receptor sites for a power plant in northern Nevada are characterized by rangeland, some low, open mountains, and an arid climate. These factors contribute to decreasing their sensitivity and exposure to acid deposition. More acid is neutralized when deposited at lower elevations because the soil is usually more alkaline in character. The arid climate, as mentioned, means lower levels of exposure because wet deposition rates are lower.

### Overview of Key Studies

National Acid Precipitation Assessment Program. The National Acid Precipitation Assessment Program (NAPAP) was created by Congressional mandate to perform a comprehensive ten-year study of the effects of acids and other pollutants emitted from fossil fuel and combustion and other sources.

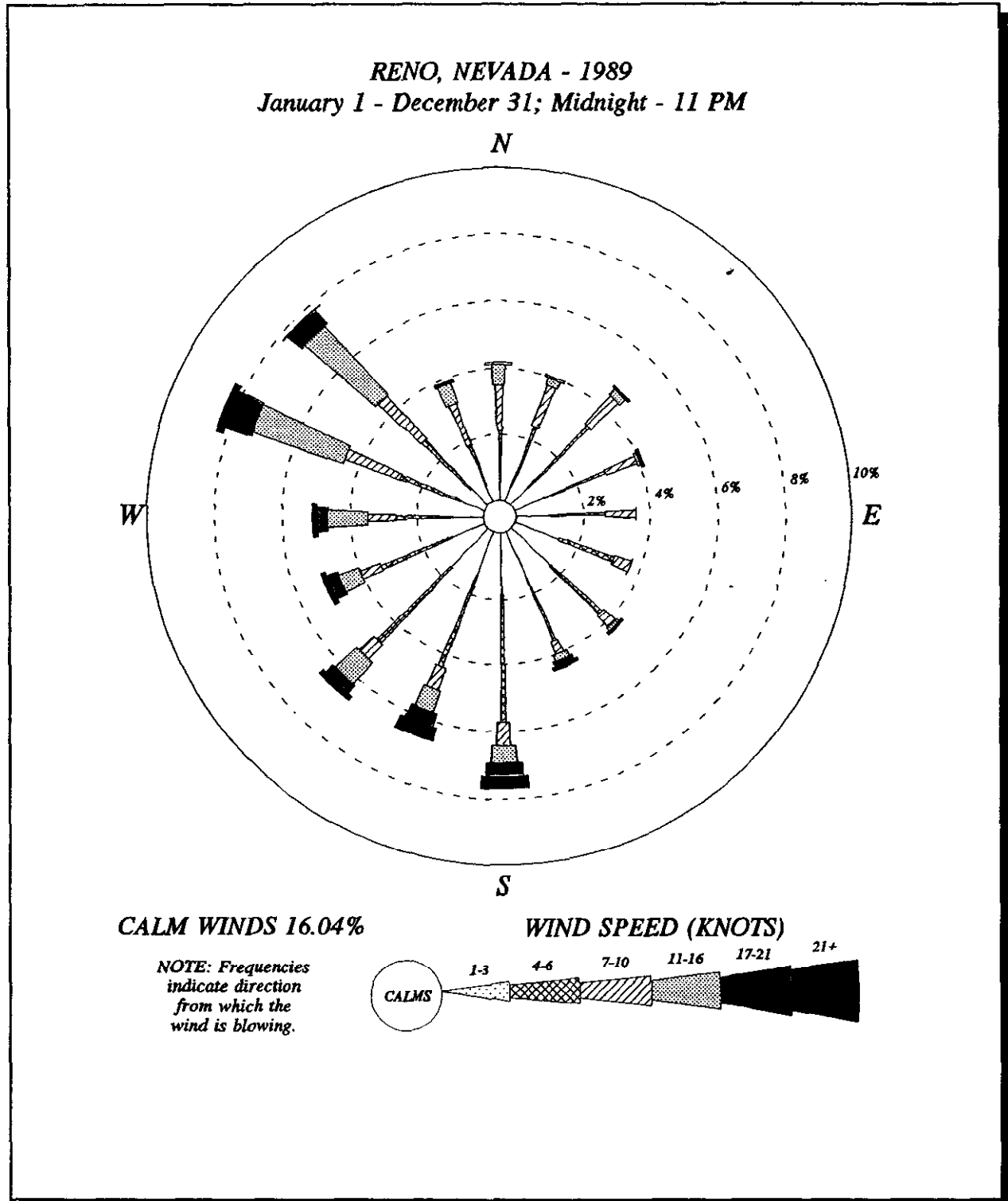


Figure 4.1.2-2. Wind rose of the Reno-Sparks area centered at the Reno airport.

*The study looked at the effects of acid deposition on the environment, the economy, and human health from scientific, technological and economic perspectives. The study involved twelve Federal agencies, four national laboratories, and four Presidential appointees as chairmen, costing roughly \$500 million (NAPAP, 1991).*

*The NAPAP studies produced a series of 27 State-of-Science and State-of-Technology (SOS/T) reports addressing emissions, controls, atmospheric processes and modeling, terrestrial effects, aquatic effects, and effects on materials and cultural resources as well as visibility, human health effects and economic valuation of effects. In addition, NAPAP produced an Integrated Assessment Report designed to interpret and evaluate the data from the focused reports.*

### Studies

*Beyond the NAPAP summary documents, two other documents that provide particularly useful information and background are The American West's Acid Rain Test (Roth, 1985) published by the World Resources Institute (WRI) and Acidic Deposition: Sulphur and Nitrogen Oxides (Legge and Krupa, 1990) published by the Alberta Government/Industry Acid Deposition Research Program (ADRP). The WRI report focuses on acid deposition effects in the western United States. Its scope is much smaller than that of NAPAP, but its western focus provides useful information on issues which NAPAP examined mainly in the East. This information includes maps showing acid deposition and emission patterns in the western United States and depictions of the prevailing surface winds at key emission sites.*

*The ADRP study did not conduct any empirical studies in the United States but its compilations and critiques of earlier authors' studies in many different parts of North America are extremely helpful in isolating effects of concern. For example, it reviews and summarizes a large collection of studies examining the effects of acid precipitation on agriculture and on forests, thereby putting a wealth of evidence into the one organized paper.*

*The following sections address the potential for damages from northern Nevada emissions, first considering impacts on lakes and other bodies of water, and then impacts on forests and agriculture.*

Lakes and Other Bodies of Water

*Acid deposition includes the deposition of both nitrates and sulfates. However, most models of surface water acidification assume that little or no deposited nitric acid gets into surface water—meaning the nitrate deposited in soil is either neutralized or retained, and nitrate deposited directly into waterbody is captured by biological and chemical processes. Thus, acid deposition studies focus primarily on sulfuric ions.*

*Potential Acid Deposition Damages. The types of damages potentially caused by nitrate deposition and sulfate deposition are essentially very similar. When either compound is deposited in lakes or streams it may cause their acidity to increase. Nitrate deposition generally causes acidity increase only in streams; sulfate deposition may increase acidity in both lakes and streams. Increased acidity may reduce fish populations and may impair other species as well. There is some evidence as well that episodic acidity (usually associated with rainstorms and snowmelt) and low pH in general can cause sphagnum moss growth (Legge and Krupa, 1990; NAPAP, 1990). The invasion of sphagnum moss in a lake is an initial step in a lake's decline, so this evidence suggests that decreased pH may accelerate lake decline.*

Impact of Emissions from Northern Nevada

*General Considerations. The pH response of a stream or lake acidic inputs is a function of its acid neutralizing capacity often measured by alkalinity. Lakes and streams with total alkalinity concentrations less than 200  $\mu\text{eq/L}$  are generally considered to be potentially sensitive to acidification, those with higher alkalinity concentrations are tolerant or resistant to acid inputs.*

*The lakes and streams downwind from the northern Nevada sites are most likely to receive acid deposition, but they are very unlikely to experience damage. All of the lakes and streams in north and central and northwestern Nevada have projected total alkalinity concentrations greater than 400  $\mu\text{eq/L}$ .*

*Two lakes are worth mentioning because of their pristine natural quality and their proximity to the proposed project. Pyramid Lake is at very low risk. Its pH is between 9.1 to 9.3 which makes it "ten times as alkaline as salt water" (Lebo et al., 1992). On the other hand, Lake Tahoe's acid neutralizing capacity is relatively weak, although its pH is between 7.0 and 7.5 (Richards, 1993). However, the lake is at very little risk due to the predominate easterly wind flow, the insignificant  $\text{SO}_2$*

*ambient concentration resulting from the proposed project, and because of its great depth. Lake Tahoe is the eighth deepest lake in the world, with an averaged depth of 980 feet and peak depth of 1,645 feet. The amount of acid deposited on the surface is small compared to the buffering capacity of more than 1,600 feet of water.*

*The Truckee River is the primary source of water for the Pyramid Lake fisheries and is an important ecosystem in itself. The Truckee River Canyon is characterized by highly alkaline soils and low precipitation. Consequently, any runoff to the river is high in alkalinity. Thus, the Truckee River would not be adversely affected by any limited deposition of sulfates due to the proposed project which may occur in the canyon area.*

*Any other potentially sensitive lakes are at low risk from the proposed project emissions because they are upwind, distant from the possible emission sources, and at greater elevation than the Tracy site.*

#### Forests and Agriculture

*Potential Acidic Deposition Damages. There has been much speculation in recent years about the effects of acid deposition on forest stands and on crops. Certain tree species in parts of North America and in Europe have shown unexplained growth or yield declines, while others have experienced increased foliage loss or mortality. Frequently the affected areas have been subject to high levels of acid deposition or gaseous air pollution. Many studies have considered the effects of gaseous NO<sub>2</sub> and SO<sub>2</sub> on plants of various types, and other studies have looked at the impact of simulated acid rain on crops or on forests.*

*The NAPAP study collected and studied a great deal of data on crop and forest health for large regions of the United States. They looked at a wide range of effects including reduced growth, mortality, decreased reproduction, and increased sensitivity to cold damage for forests. For crops, NAPAP reviewed potential loss of quality and potential for growth or yield reduction. The ADRP study performed a variety of crop studies, and compiled a literature review of the studies on forest effects. These studies do not consider separate effects of sulfates and nitrates, whether looking at historical levels of acid deposition or conducting laboratory tests with simulated acid rain. The focus is more one of reduced pH than of specific concentrations of sulfate or nitrate.*

*The NAPAP study cites one situation in which damages are potentially attributable to acid deposition. Localized areas in the eastern states of high-elevation red spruce forests that are naturally subjected to extreme winter temperatures may become more susceptible to winter injury when exposed to highly acidic cloud water (pH = 2.8-3.8) (NAPAP, 1990).*

*The ADRP study reports 14 different studies of forest decline in North America. In some instances, the cited studies found no evidence of forest decline, and in every case, insufficient evidence was available to support any hypothesized cause of forest decline (Legge and Krupa, 1990). Aside from the report on red spruce forests described above, NAPAP's conclusions and those of ADRP about the effects of acid deposition on both forests and crops, do not support the link between acid deposition and forest or crop damage.*

- *There is no evidence of widespread forest damage from current ambient levels of acidic rain (pH 4.0-5.0) in the United States (NAPAP, 1991).*
- *Acidic deposition at ambient levels in the United States is not responsible for regional crop yield reduction (NAPAP, 1991).*
- *There are no demonstrated direct effects of ambient acidic rain per se on crops under field conditions (Legge and Krupa, 1990).*

*With respect to the forests of the Sierra Nevada range, the NAPAP study concluded that "...[i]t has not been shown that acid deposition is causing any significant decrease in damage beyond that which is attributable to [ozone] alone . . . ." (NAPAP, 1990).*

*Some laboratory studies performed with simulated acid rain suggest that crop damage might occur at very low pH levels, (e.g., 3.6 or less) (NAPAP, 1991; Legge and Krupa, 1990). In contrast, however, other studies suggest potential benefits from sulfur and nitrogen deposition in areas where naturally occurring supplies are low because both are nutrients essential for plant growth.*

#### *Impact of Northern Nevada Emissions*

*Less than one percent of Nevada is used for cropland (Mason and Mattson, 1990). Furthermore, the overwhelming consensus among researchers is that the application of fertilizers and*

*other agricultural management is much more central to the chemistry of plant-soil relationships. For example, estimated sulfur deposition rates over a six month growing season would be roughly 2.6 kg/ha in the West (Council on Environmental Quality, 1992). In contrast, irrigation water has been measured to contain about 30 pounds of sulfur for every 12 acre-inches applied, equivalent to 34 kg/ha if water is applied at standard rates of 30-40 in/ha (Legge and Krupa, 1990). That is, the irrigation activity supplies over ten times the sulfur that would be deposited through acid deposition.*

*The receptor sites for northern Nevada emissions are not heavily forested. According to the U.S. Forest Service, Nevada had only 221,000 acres of timberland in 1987, less than any other state in the nation (Alig et al., 1990). Using a measure of forestland that includes juniper, chaparral, and other western softwoods, about ten percent of Nevada is forested (Mason and Mattson, 1990, p. 50; U.S. Department of Agriculture, 1981). The piñon-juniper forest type accounts for 80 percent of Nevada's woodland, while most of the remainder is composed of juniper type forestlands. Other woodland types account for less than two percent of total woodland area (U.S. Department of Agriculture, 1992). In the Sierra Nevada range of California, a variety of oaks, pines, and firs are found at lower elevations, while above 5,000 feet, red and white fir, western white pine and lodgepole pine predominate. These species, which predominate in Nevada's forests, do not include red spruce. The red spruce is one species in which there is some evidence that shows there is damage from highly acidic cloudwater and acid mists.*

#### Summary of Ecosystem Damages

*The NAPAP study indicates acid deposition effects are generally much less severe than many earlier commentaries feared. For the United States as a whole, NAPAP concludes that a relatively small number of ecosystems are threatened by deposited nitrates and sulfates. Virtually all of these damages occur in the East, where some lakes and forests have relatively low ability to absorb increases in acidity. In contrast, lakes and forests in the West have high pH levels (low acidity). Specifically, the Truckee River Canyon and Pyramid Lake are characteristically high in alkalinity and thus are not threatened.*

#### **4.1.2.4 Global Climatic Change**

A major world environmental issue is the possibility of major changes in the global climate (i.e., global warming) as a consequence of increased concentrations of "greenhouse" gases, especially CO<sub>2</sub>,

## Piñon Pine Power Project

(Mitchell, 1989). It is generally agreed that fossil fuel burning is the primary contributor to increased concentrations of CO<sub>2</sub>. Because CO<sub>2</sub> is stable in the atmosphere and essentially uniformly mixed throughout the troposphere and stratosphere, the climate impact does not depend on the geographic location of sources. Therefore, an increase of CO<sub>2</sub> emissions at a specific coal-burning source would effectively alter CO<sub>2</sub> concentrations only to the extent that it contributes to the global total of fossil fuel burning that increases global CO<sub>2</sub> concentrations.

The proposed Piñon Pine Power Project would be expected to emit no more than 790,000 tons (711,000 metric tons) per year of CO<sub>2</sub>. This amount is compared with current estimates of CO<sub>2</sub> emissions generated by U.S. and global fossil fuel and coal combustion in Table 4.1.2-12. The percentage increases in CO<sub>2</sub> emissions contributed from the proposed project compared to the U.S. coal combustion would be about 0.0004 percent and compared to global fossil fuel combustion about 0.00003 percent.

**Table 4.1.2-12. Comparison of estimated annual carbon dioxide (CO<sub>2</sub>) emissions<sup>1</sup>.**

Proposed CO <sub>2</sub> emissions <sup>2</sup> (metric tons/year)	Percentage of U.S. coal combustion <sup>3</sup>	Percentage of U.S. fossil fuel combustion <sup>4</sup>	Percentage of global fossil fuel combustion <sup>5</sup>
711,000	0.0004	0.0001	0.00003

<sup>1</sup>Source: CDIAC at Oak Ridge National Laboratory, personal communication, April 5, 1993.  
<sup>2</sup>Includes all point sources emissions of CO<sub>2</sub>.  
<sup>3</sup>U.S. coal combustion produces 1,807 million metric tons of CO<sub>2</sub> per year.  
<sup>4</sup>U.S. fossil fuel combustion produces 4,940 million metric tons of CO<sub>2</sub> per year.  
<sup>5</sup>Global fossil fuel combustion produces 22,710 million metric tons of CO<sub>2</sub> per year.

### 4.1.3 Geology and Soils

This section discusses the general impacts of construction and operation on geologic resources and soils as well as the potential implications of seismic activity and soil type for the proposed project. Detailed engineering design is not completed. As part of the detailed design, a subsurface investigation would be performed within the footprint of the proposed buildings and other key structures. This geotechnical report would include the following:

1. Evaluation of the liquefaction potential of the near-surface, saturated, loose to medium dense sands. If these soils are found liquefiable, the report would list mitigating measures.
2. Evaluation of the collapse potential of the soils beneath heavily loaded foundations. If these soils are found to be collapsible, the report would provide mitigating measures.
3. Calculation of the settlement of individual footings. If calculated settlements are found to exceed tolerable settlement values, then the report would include mitigating measures.
4. Evaluation of corrosion potential. For this, field and laboratory soil resistivity and the pH value of the site soils would be measured. Based on these results, the "years to penetration" due to corrosion of buried metals would be calculated. The design of the buried components subject to corrosion would be based on the "years to penetration" calculations. If the site soils are found to be highly corrosive, corrosion-sensitive components would be protected by cathodic protection.
5. *Evaluation of excavation slope stability and design of the coal off-loading facility.*

#### **4.1.3.1 Geology and Seismic Activity**

As shown in the previous discussion of regional tectonics and historical seismicity (provided in section 3.3, Geology and Soils), it has been determined that a number of potential seismic sources could affect the site. Because a small earthquake close to the site may have just as great an effect on-site as a larger earthquake more distant from the site, a number of potential seismic sources were evaluated to assess their impact on the site.

Seismic hazards may include ground rupture, which includes not only surface displacement along faults but also lateral spreading and lurch-cracking, strong ground motion, differential settlement, liquefaction, and seismically-induced slope failures. Surface rupture would be a hazard to the site only if there is fault displacement beneath the facility. Published geologic maps do not indicate the presence of any faults through the site and no faulting was reported during the construction of existing Tracy Power Station facilities; however, the close proximity of the Olinghouse Fault (north of the site), presents a remote possibility that parallel faults may pass through the site. Lateral spreading and lurch-cracking

occur on the surface and generally are associated with loose soils and liquefaction-prone soils. Loose surface soils would be susceptible to lateral spreading or lurch-cracking if they are saturated during a major earthquake. Strong ground motion or ground shaking is the most likely seismic hazard to affect the site. Ground motion can cause direct damage to structures and natural features and also can induce other seismic hazards such as liquefaction, settlement, surface cracking, and slope failure. The extent of seismic ground shaking depends on the energy of the source earthquake, the distance from the earthquake epicenter, local site conditions, and other factors.

The number of earthquakes in the historical record near Tracy Station (see Table 3.3-1) show that the probability of an earthquake occurring near the site [within 161 km (100 miles)] is high. Some estimates predict that an earthquake of 7.0 or greater magnitude (measured on the Richter scale) could occur in west-central Nevada as frequently as every 45 years (*Ryall and Van Wormer, 1980*) or every 75 years (*Gates and Watters, 1992*). The location of the site on the Uniform Building Code (UBC) Zone 3/4 boundary (*ICBO, 1991*) is an indication of the high potential for the site to experience strong ground motion.

Worst-case scenarios for ground shaking at the Tracy Station site would be caused by the most severe earthquake that reasonably could be attributed to a nearby active fault (*Slemmons, 1980*). Peak horizontal ground motion is a common parameter used to express ground shaking at a particular location. The peak horizontal acceleration (for rock) that would be associated with the maximum credible earthquake (MCE) on major active faults that could affect the site is presented in Table 4.1.3-1. Magnitudes were taken from *Slemmons (1980)* and *dePolo (1992)*. Acceleration values were not corrected for local site conditions of gravel.

In the worst-case scenario, the Olinghouse Fault would be the controlling fault for the site with an estimated peak horizontal bedrock acceleration of 0.63 g (nearly twice as high as the next highest acceleration) if the MCE occurred at the closest approach to the site (see Table 4.1.3-1). A seismic hazard curve for the proposed site that incorporates the recurrence intervals of MCEs on active faults in the Tracy area is presented in Figure 4.1.3-1. Peak accelerations are expressed as a function of occurrences or events per year. An event such as the magnitude 7.0 MCE on the Olinghouse Fault has a return period of about 8,600 years or an occurrence rate of slightly more than 0.0001 events per year. The probability of any MCE event occurring is less than 0.01 events per year.

Table 4.1.3-1. Maximum credible earthquakes for faults in the Tracy area.

Geologic subprovince (after Slemmons, 1980)	Fault	Distance from Tracy to closest mapped trace of fault (mi)	Maximum Credible Earthquake <sup>1</sup> (MCE)	Estimated Peak Ground Acceleration at Tracy <sup>2</sup> (g)
Sierra Nevada	Mohawk Valley	33 <sup>3</sup>	7.4	0.12
	West Edge of Tahoe Basin	33 <sup>3</sup>	7.0	0.09
	Long Valley Fault Zone	26 <sup>4</sup>	7.3 <sup>5</sup>	0.15
Sierra Nevada Frontal Fault Zone	Genoa	17 <sup>6</sup>	7.6	0.25
	Peterson Mountain	22 <sup>4</sup>	7.1 <sup>5</sup>	0.14
	Freds Mountain	17 <sup>4</sup>	7.1 <sup>5</sup>	0.18
	Spanish Springs Valley	11 <sup>4</sup>	6.9 <sup>5</sup>	0.24
	East Reno Basin	7 <sup>4</sup>	6.9 <sup>5</sup>	0.33
Truckee-Verdi-Reno- Olinghouse Transverse Zone	Olinghouse	1 <sup>5</sup>	7.1	0.63
	Dog Valley	33 <sup>3</sup>	7.5	0.12
Walker Lake north and west of Pyramid Lake	Honey Lake	35 <sup>3</sup>	7.5	0.12
	Warm Springs	11 <sup>4</sup>	7.2 <sup>5</sup>	0.28
Walker Lane-Sierra Nevada Frontal Fault Zone Transition	Carson Lineament	15 <sup>4</sup>	6.8 <sup>5</sup>	0.18
	Wabuska Lineament	31 <sup>4</sup>	6.7 <sup>5</sup>	0.09
	Smith Valley Fault Zone	35 <sup>4</sup>	7.2 <sup>5</sup>	0.10
	Singatz Range Fault Zone	39 <sup>4</sup>	7.0 <sup>5</sup>	0.07
Walker Lane Northeast of Tracy	Pyramid Lake Strand	15 <sup>1</sup>	7.5	0.26
Great Basin East of the Walker Lane	Rainbow Mountain	60 <sup>1</sup>	6.65	0.03
	Fairview Peak and Dixie Valley	80 <sup>1</sup>	7.7	<0.05

<sup>1</sup> Slemmons (1980).  
<sup>2</sup> Mualchin and Jones (1992).  
<sup>3</sup> Jennings (1992).  
<sup>4</sup> dePolo (1992).  
<sup>5</sup> "Potential Earthquake Magnitude" dePolo (1992).  
<sup>6</sup> Bonham (1969).

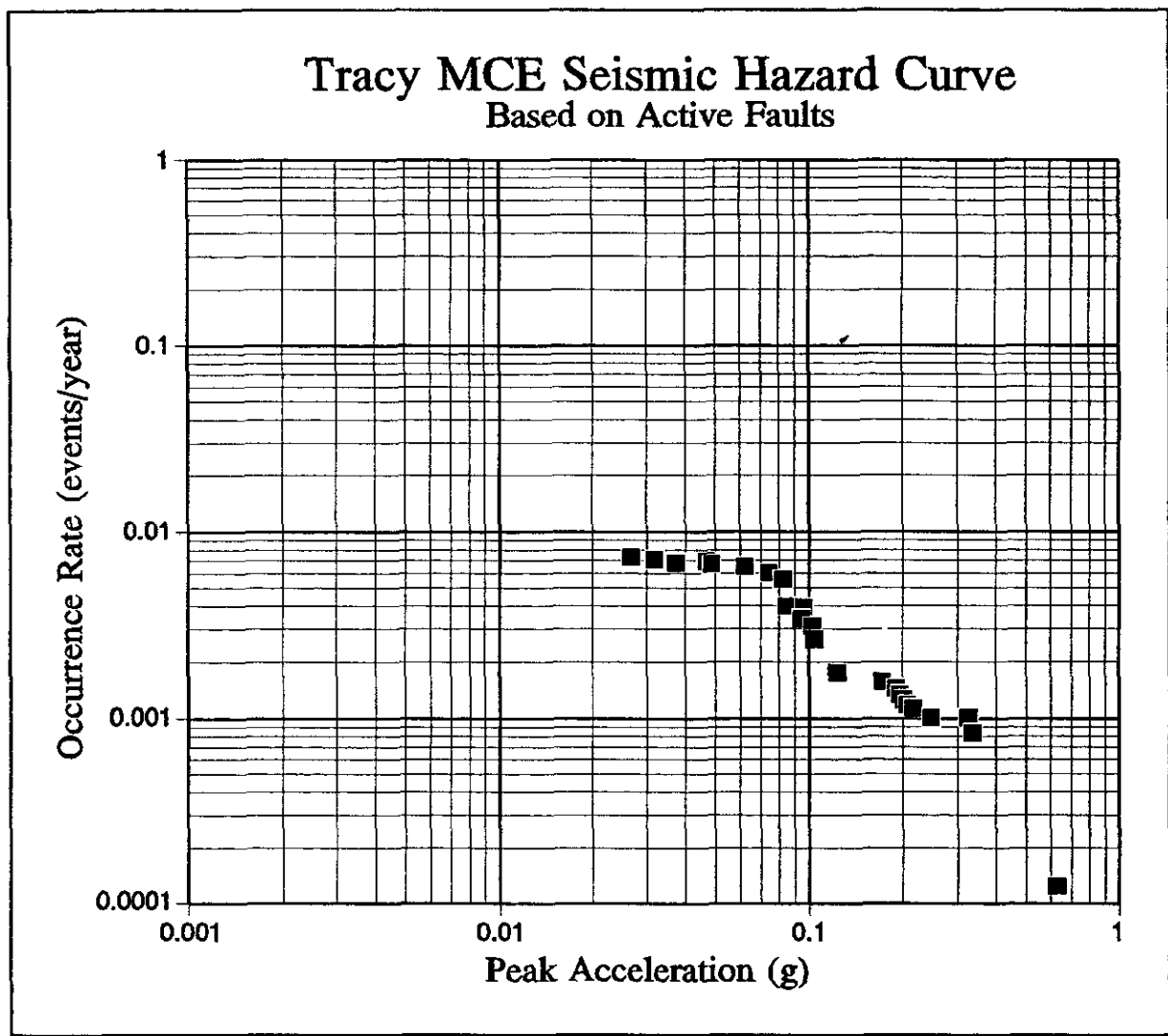


Figure 4.1.3-1. Recurrence rate of MCEs in the Tracy Power Station area.

Although it is unlikely that the site would experience an MCE during its 35-year design life, the high historical seismicity suggests that the site would experience strong ground motion to some degree. Therefore, the facility would be designed and constructed in accordance with UBC Seismic Zone 4 guidelines. The intent of UBC specifications is to ensure that structures are designed and constructed to resist the effects of potential seismic ground motion and wind speeds; the most stringent requirements apply. The specifications are based on the structure's location (seismic zone, soil characteristics, and wind speeds), purpose, size, and construction materials used. In addition to building specifications, specific requirements are provided for stacks, silos, cooling towers, bins and hoppers, and other non-

building structures. UBC specifications include values for minimum vertical and lateral (horizontal) loads. Specific requirements also are provided for roofs; walls; storage racks; tanks and vessels; electrical, mechanical, and plumbing equipment; fire sprinkler supports; and elevators (*ICBO, 1991*).

**Construction Impacts.** If an earthquake were to occur during construction, the greatest threat would be to worker safety. As discussed in section 4.1.10, only small quantities of hazardous materials would be generated during construction so no impact would be anticipated from a breach in containment. Although possible, there is little likelihood that an earthquake would occur during the 26-month construction period.

**Operation Impacts.** Because of the design features to be implemented, if an earthquake were to occur, external structures and internal features of the proposed Piñon Pine Power Project would be expected to withstand the potential force. If a breach in containment were to occur, the procedures delineated in the Chemical Emergency Response Plan and Spill Prevention Control and Countermeasures Plan (discussed in section 3.10) would be followed to reduce or eliminate the extent of the potential impact.

#### **4.1.3.2 Soils**

**Construction Impacts.** Large areas of soil would be disturbed during construction of the proposed project, resulting in the displacement of approximately 91,800 cubic meters (120,075 cubic yards) of soil. Best management practices (BMPs) would be employed to control erosion. Soils disturbed would be either covered by gravel or stabilized by compaction or with an approved chemical soil binder to reduce erosion and particulate air pollution.

Various soil characteristics impact engineering design. The Saralegui-Isolde Association soils exhibit low shrink-swell potential; thus, changes in humidity should not impact structures constructed in the site soil. In addition, the site is essentially flat and, therefore, no potentially unstable slopes exist or are planned.

Soil excavations would follow current OSHA regulations (*OSHA, 1989*), which require the excavation itself, if it exceeds 6 meters (20 feet) in depth, to be designed by a registered professional engineer. Only the excavation for the coal unloading station is expected to exceed 6 meters (20 feet).

Although standard penetration tests, performed by Stone and Webster (1971), showed no liquefiable zone within the footprint of existing structures, it is remotely possible that liquefiable zones exist within the footprint of the proposed Piñon Pine Power Project structures. Consequently, a design-level subsurface investigation program would be implemented. If liquefiable material (i.e., loose, saturated sands that when subjected to vibration tend to compact and decrease in volume causing increased pore water pressure, which results in the sand behaving like liquid) is found, appropriate mitigation measures (such as excavating and removing loose to medium density materials) would be implemented.

Based on test data and calculations performed (Stone and Webster, 1971), near-surface site soils appear to have a moderate potential for collapse. Collapse of soils occurs on first saturation and can result in gradual settlement or a sudden collapse. Three units have been constructed on the site and heavy equipment currently rests precisely where the proposed Piñon Pine Power Project's unit would be placed. In the past, SPPCo.'s construction crews have over-excavated, saturated the soil, and then compacted prior to construction. To date, there have been no problems with existing facilities due to soil collapse.

Leaching is a phenomenon by which chemical components of soil are removed by solution. Drilling performed by Stone and Webster (1971) concluded that the potential for leaching is low.

Lateral spreading results in a weak zone and the potential for instability is characteristic of certain soil types. The soils at the proposed site do not fit the description of typical soils with lateral spreading potential. Consequently, it is concluded that the potential for lateral spreading is low.

The potential for piping (erosion of soils caused by groundwater flow that emerges on a surface and carries particles of soil with it) is generally low.

Because of the rapid (15 to 51 cm or 6 to 20 inches per hour) permeability and slight potential for water erosion, sedimentation problems would be expected to be minimal. Any stormwater on the plant site would be discharged into the cooling pond, which can accommodate approximately 43 acre-feet of runoff without overflowing. A portion of the surface runoff would be conveyed into a storm sewer system through drop inlet catch basins and routed through an oil/water separator before discharging into the cooling pond. An erosion and sediment plan would be implemented.

*As discussed in section 3.3.2, the type of soil encountered on-site is generally rated highly corrosive to steel. A site-specific resistivity survey (Kleinfelder, 1993) showed moderate corrosion*

*potential to steel. Consequently, a soil resistivity test program would be implemented and used in the design of underground features.*

No construction activity would be expected to impact soil quality. Use of mitigation measures would reduce or eliminate direct impacts from soil displacement and indirect impacts associated with structural integrity built on the soils of the area.

**Operation Impacts.** No activity associated with the operation of the proposed Piñon Pine Power Project would be expected to impact soil erosion or soil quality. However, procedures are in place (see discussion on Spill Prevention Control and Countermeasures Plan and Chemical Emergency Response Plan in section 3.10, and the discussion on hazardous material containment in section 4.1.10) for the response to and remediation of a spill that would potentially contaminate the soil.

#### **4.1.4 Water Resources**

This section discusses the potential impacts, both direct and indirect, from construction and operation of the proposed plant to the surface water, groundwater, and water table of the surrounding area. An impact to surface water resources could result from a change in the hydrologic cycle; from the introduction of suspended and dissolved substances into receiving waters; large withdrawals of water for consumptive uses; alterations in stream flow patterns; changes in precipitation and evaporation; surface water quality; and groundwater flow and quality. Degradation of water quality also could affect aquatic ecosystems and uses of downstream resources. Impacts to local surface water and groundwater quality resulting from: (1) sedimentation and erosion; (2) extensive soil disturbance, vegetation disturbance, stockpiling earthen materials, disruption of stormwater drainage patterns, and surcharging stormwater conveyance systems; (3) storage and use of petrochemicals and solvents and related spills; (4) temporary storage of solid waste; (5) increased sewage generation; and (6) large quantities of water withdrawal are discussed. The following sections describe the nature and extent of potential short- and long-term effects of these sources, as well as direct and indirect impacts and planned measures incorporated into the project design that would reduce the severity of the impacts.

##### **4.1.4.1 Water Use and Availability**

Water use would be expected to be relatively constant year-round with slightly more water being used in warmer summer months for process replacement water. Because the proposed plant has

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approximately 3,500 acre-feet per year (4.9 cfs) of water rights available under the Orr Ditch Decree and two underground water rights totaling 600 acre-feet per year (0.8 cfs), no additional water rights would be needed. A summary of estimates of water consumption rates that would occur from the operation of the *Tracy Power Station including the proposed Piñon Pine Power Project* is provided in Table 4.1.4-1. More detailed monthly water consumption estimates with and without the proposed project, and historic water consumption rates (from 1985 to 1993) for the Tracy Power Station are provided in Appendix E.

**Construction Impacts.** During the 26-month construction phase, projected water usage would not differ from current consumption. Consumption would average 1,972 acre-feet per year (1,221 gpm, 2.8 cfs), which is comparable to recent annual withdrawals at the Tracy Station site. Consequently, construction would be unlikely to affect water availability. Potable water for construction workers would be brought in as bottled water or would be obtained from well water pending a satisfactory analysis of water from the new well (see section 3.4.3).

**Operation Impacts.** The average water consumption rate for the Tracy Station site for cooling after the start-up of the proposed Piñon Pine Power Project is estimated to be 2,806 acre-feet/year (or 3.9 cfs), averaged over the operation years 1997 through 2011 and excluding the construction years prior to 1997 (see Table 4.1.4-1). Of this amount, 1,004 acre-feet/year (1.4 cfs; 630 gpm) would be attributed to the proposed Piñon Pine Power Project. No change would be anticipated in water use during drought conditions.

During the early design phases of the project, SPPCo. incorporated several measures to reduce water consumption. *These water-conserving measures are currently part of the proposed plant and have been considered for water consumption estimates.* The original design was altered and a larger, more efficient plant was proposed that would not require steam for sulfur sorbent temperature control (a savings of 12 gallons/MWh). The selection process of a demineralized water system has concentrated on minimizing the amount of water discharged to the new evaporation pond, which would reduce water consumption by 15 gallons/MWh. Providing for the use of a portion of boiler and cooling tower blowdown would reduce water consumption by 102 gallons/MWh. SPPCo. also has proposed converting the existing plant-bearing cooling water system to a closed cooling system to reduce groundwater consumption (a savings of approximately 63 gallons/MWh). In addition, condensate from space heaters, auxiliary steam, and gland steam condensers would be recovered for a savings of 1 to 2 gallons/MWh. Using vacuum pumps instead of steam jet air ejectors for vacuum control would save 1 gallon/MWh and

recovering sample drains not contaminated by reagents also would save 1 gallon/MWh. Other water savings measures incorporated into the proposed design but that have not been quantified include:

- Providing additional cooling capacity to avoid the need for water spray during peak loads;
- Using metal seated ball valves to reduce steam/water leakage from drain and vent lines;
- Using electric heat tracing rather than steam heat tracing for freeze protection;
- Using mechanical seals instead of water cooled packing glands, where suitable;
- Placing high level alarms on water storage tanks to reduce overflow occurrences;
- Using conductivity alarms on the demineralized water system to avoid contamination of storage tank contents;
- Re-using water from the coal unloading sumps as make-up water for the dust suppression system; and
- Using a compressed air soot blowing system (if required with the selective catalytic reduction (SCR) system).

Under normal flow conditions, all water rights on the river are met; therefore, no impact to other water rights holders *would occur*. Using the lowest flow conditions of the past 20 years (i.e., *50.5 cfs* in October 1992), the amount of anticipated added average withdrawal (1.4 cfs) from the Truckee River *due to* the proposed Piñon Pine Power Project would be equal to approximately 3 percent of the lowest expected monthly flow. During these 20 years (which include a 6-year drought), lowest flow conditions have occurred in only 2 months (*50.5 cfs in October 1992 and 55 cfs in August 1992*; see Table 4.1.4-2). Once senior water rights between Derby Dam and Pyramid Lake are met, flows can be diverted to the Truckee Canal. *Any unappropriated or unused stream flow would reach Pyramid Lake when all regulated water withdrawals have been made. Under these conditions, use of the additional 1.4 cfs of water by the proposed project then would decrease the unappropriated flow available in the Truckee River to Pyramid Lake by less than 0.5 percent.* Because SPPCo.'s existing water rights are senior to

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Table 4.1.4-1. Summary of estimated water consumption rates at Tracy Power Station with the proposed project.

Year	Tracy Power Station with Piñon Pine*	
	Total acre-feet	Average cfs
1993	1,562	2.2
1994 <sup>1</sup>	1,643	2.3
1995 <sup>1</sup>	1,651	2.3
1996 <sup>1</sup>	2,622	3.7
1997	2,493	3.5
1998	2,843	4.0
1999	3,057	4.3
2000	2,924	4.1
2001	3,002	4.2
2002	2,987	4.2
2003	2,874	4.0
2004	2,768	3.9
2005	2,830	4.0
2006	2,779	3.9
2007	2,793	3.9
2008	2,742	3.8
2009	2,574	3.6
2010	2,730	3.8
2011	2,694	3.8

<sup>1</sup> Denotes construction phase.  
 \* Of the amounts shown, 1,004 acre-feet/year (1.4 cfs) would be attributed to the proposed Piñon Pine Power Project operating under full load conditions.

most other water rights holders (except the Pyramid Lake Paiute Indian Tribe), additional water use by the company would most likely reduce the amount of water available for agriculture to the Newlands Project, and for other junior water rights holders. In general, downstream water users would have the potential to lose access to less than 0.5 percent of the Truckee River's flow and typically would lose between 0.1 and 0.2 percent (see Table 4.1.4-2). *It should be noted that the Pyramid Lake Paiute Indian Tribe holds the most senior rights (1859) to the Truckee River; these rights must be met before SPPCo. can withdraw any water.*

The endangered Cui-ui sucker and threatened Lahontan cutthroat trout are the two fish species potentially affected by changes in water diversion at the project site. Although neither species is present in the vicinity of the project, greater usage of existing water rights could decrease flow in downstream areas for spawning and rearing of Cui-ui, or for spring attraction flows for Lahontan cutthroat trout migrating out of Pyramid Lake. The Cui-ui Recovery Plan (USFWS, 1992) and Truckee River Operating Agreement (TROA) are two programs that currently address operational mechanisms, water rights acquisition, and other methods to provide sufficient water for fisheries resources in the Truckee River basin. As stated previously, the Cui-ui Recovery Plan assumes full use of SPPCo.'s existing water rights.

The average additional withdrawal of Truckee River water at the project site is approximately 84 acre-feet per month (1.4 cfs), or approximately 0.23 percent of Pyramid Lake monthly inflow during the April to July time period, which has been identified as the spawning period for the Cui-ui (USFWS, 1992), and 0.18 percent of inflow during the

attraction flow period in April and May. Even if this additional volume were to be drawn from the

Table 4.1.4-2. Mean Truckee River flows (cfs) below Tracy, NV (USGS Gage L0350400).

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	YEAR
1980	432	370	367	1470	916	635	933	1862	1113	428	325	377	769
1981	360	467	505	451	445	363	485	1434	325	200	226	230	459
1982	495	1164	1586	681	1712	1002	2620	4421	2660	765	352	661	1505
1983	915	2112	2753	1576	2553	3705	3595	4336	5701	3035	1065	1476	2731
1984	526	2820	3908	3328	1977	1546	1108	1659	1359	486	323	367	1617
1985	437	573	548	488	552	669	1311	1606	448	288	269	404	633
1986	414	473	482	576	3865	4955	3021	2601	1452	513	388	396	1579
1987	473	475	480	545	572	804	879	1199	522	353	289	378	581
1988	426	394	435	446	416	353	445	400	321	277	342	257	376
1989	98	176	159	250	238	914	983	746	633	295	311	379	432
1990	418	380	352	251	259	424	720	435	283	208	201	94	336
1991	94	102	113	131	139	367	440	431	388	356	97	68	228
1992	63	155	163	154	221	307	280	237	92	65	55	65	154
1993	50.5	104	188	365	388	1114	1018	1454	1172	424	253	222	563
MEAN (1972-1993)	399	626	733	714	856	1064	1160	1519	1044	539	378	400	790
Average projected increase in diversion due to Piñon Pine	1.4	1.4	1.4	1.3	1.5	1.6	1.5	1.4	1.3	1.7	1.6	1.6	
Average projected decrease as percent of monthly mean	0.4%	0.2%	0.2%	0.2%	0.2%	0.2%	0.1%	0.1%	0.1%	0.3%	0.4%	0.4%	

inflow to Pyramid Lake, the diversion would have no adverse effect on Cui-ui in the lower Truckee River because no effect to downstream users is anticipated during any condition other than very low flow conditions. Lowest flow conditions have occurred in 2 months (*August and October 1992*) during the past 20 years and withdrawal for the proposed Piñon Pine Power Project would constitute only 3 percent of this flow. Cui-ui have migrated from the Truckee River back to Pyramid Lake prior to the lowest flow period of August to October. Lahontan cutthroat trout migrating out of Pyramid Lake currently are captured at Marble Bluff dam and spawned in the hatchery. Because of the insignificant hydrological impact of the project on Truckee River inflow to Pyramid Lake, the project would not affect Lahontan cutthroat trout migration or survival. A more detailed discussion of impacts to these fish species is presented in section 4.1.6.3.

#### **4.1.4.2 Surface Water**

**Construction Impacts.** During construction, BMPs would be implemented to control nonpoint source pollution discharges to surface waters. BMPs would consist of typical erosion and sediment controls, such as measures to prevent petroleum product discharges, and sediment controls limiting soil disturbance to the minimum necessary; vegetating and mulching denuded areas; diverting runoff away from denuded areas; and trapping sediment with sediment retention structures. Because any on-site stormwater runoff would be directed to the cooling pond, the purpose of the BMPs would be to protect the water quality and aquatic life of the cooling pond.

The use of BMPs would alleviate sedimentation and siltation during construction; therefore, no significant direct, long-term adverse impacts to the water quality would be expected. In addition, because there would be no additional withdrawals of water during the construction phase, no direct or indirect adverse effects on river flow are expected.

Standard practices for containing waste, minimizing and stabilizing disturbed areas, protecting slopes and channels, controlling site perimeter, and controlling internal erosion would be implemented.

**Operation Impacts.** The mean monthly increase in withdrawal from the river would range from 1.3 cfs to 1.7 cfs. This represents an increased range of 0.1 percent to 0.4 percent of the mean monthly flows (see Table 4.1.4-2). The change in flow of the Truckee River that would result from increased withdrawals because of the proposed project would be imperceptible. Consequently, the direct impact on river quality would be of low magnitude.

The cooling pond at Tracy presently supports a viable warmwater fishery and would continue to do so with new IGCC cooling requirements. Cooling tower blowdown would not be directed to the cooling pond, but would be directed to the proposed evaporation pond, therefore, cooling pond water quality would not be degraded.

Discharges from the proposed project, including nonrecycled cooling tower blowdown; blowdown from the gasifier, sulfator, and heat-recovery steam generator; reconcentration waste from the demineralization package; and some miscellaneous discharges would be directed to the new, *double*-lined evaporation pond. This pond would be regulated by the NDEP under NRS Chapter 445. The pond would be monitored for pH and would be maintained in the range of pH 2 to 12 with a target pH of 7. The new evaporation pond could be toxic to aquatic life because of pH levels at the low end of the range and high concentrations of salts and dissolved metals. The quantities of discharge to the evaporation pond from the cooling tower and the demineralization package would be variable, depending on the plant operation. Approximate discharges of selected effluents to the evaporation pond would be 0.12 cfs (53 gpm) for cooling tower blowdown and 0.0082 cfs (3.6 gpm) for demineralizer waste. There would be no discharge into the Truckee River from the new evaporation pond; therefore, no direct adverse impact (either short- or long-term) to the water quality of the river would result from the operation of the proposed Piñon Pine Power Project.

Stormwater from the proposed project during the operational phase would be routed to the cooling pond and could result in some siltation of the cooling pond. However, because the average annual rainfall is *19.05 cm (7.5 inches)*, it is unlikely that a storm event could result in significant runoff; the impact from runoff would not be adverse. Routing of the stormwater runoff to the cooling pond would prevent discharge of suspended material to the Truckee River. The cooling pond can accommodate approximately 43 acre-feet of runoff without overflowing. *According to the National Oceanic and Atmospheric Administration Atlas 2, Volume VII (Miller, 1973), the rain index of the 100-year, 24-hour precipitation event is 2.8 inches. Inflow to the cooling pond, therefore, would equal 2.8 inches multiplied by the drainage area (80 acres) for a maximum potential of 18.67 acre-feet, which can easily be accommodated by the cooling pond.* Chemical and petroleum product and hazardous waste storage and handling procedures would be designed to prevent accidental spills.

BMPs also would be utilized during the operational phase of the proposed project. Standard practices for managing materials, spill prevention, and storm drain maintenance, as described in section 4.1.12 (pollution prevention) would be followed.

#### **4.1.4.3 Groundwater**

A groundwater flow model (MODFLOW) indicated that the Truckee River currently loses approximately 0.26 cfs per 1,000 feet of river length to the surrounding aquifer. This loss is in general agreement with observed losses in the river of about 0.25 cfs per 1,000 feet, although evaporation and withdrawals would have to be factored in to make this comparison completely meaningful. In addition, a crude mass balance on the cooling pond indicated that the simulated rate of infiltration is consistent with the rate of make-up water and potential evaporation from the surface of the pond. The MODFLOW calibrated model was used to simulate the groundwater impacts from two changes proposed for the Piñon Pine Power Project: First, construction dewatering during excavation of the coal off-loading facility, which would be short-term but may be intense; and second, the pumping of groundwater to support the increased water supply requirements for the proposed project. Additional information on groundwater modeling is provided in the Technical Document on Water Quality, available in the reading rooms (see Appendix H).

**Construction Impacts.** Groundwater is currently withdrawn via water-supply Wells #1 and #3 at a rate of approximately 423 acre-feet per year (263 gpm). This rate would not be expected to increase during construction of the proposed project. Water used for fire protection and dust suppression would be obtained from the existing cooling pond and would not draw upon groundwater resources.

Dewatering during coal off-loading facility excavation and construction was simulated using the calibrated model by creating a drain in Layer 1, 15 meters (50 feet) below the ground surface and near the bottom of Layer 1 at 1,286 meters (4,220 feet) msl. The coal off-loading facility would be a 15 meters x 30 meters (50 feet x 100 feet) facility with a depth of 15 meters (50 feet) from the ground surface. This model predicted that drawdown during excavation and construction of the coal unloading facility would result in the water table being lowered in this area across a small radius of influence [less than 150 meters (500 feet)] because of the relatively low hydraulic conductivities. The model also indicated that the underlying layers would experience maximum drawdowns of only 0.26 meters (0.84 feet) in Layer 2, 0.11 meters (0.36 feet) in Layer 3, and 0.006 meters (0.019) feet in Layer 4. The drain had little effect on the site in the vicinity of the monitoring wells, which underwent a 0.03 meter (0.1 foot) drop. The drawdown apparently would create a steep gradient resulting from the low to moderate hydraulic conductivity projected for that area [1.7 meters/day (5.7 feet/day)]. The model indicated a flow from the drain of only 86 m<sup>3</sup>/day (3,047 ft<sup>3</sup>/day, 16 gpm), to maintain the necessary drawdown.

However, this value cannot be used in design without a confirming pump test; because of the variations in hydraulic conductivity, greater pumpage rates could result.

The only potentially major influence on groundwater flows, *therefore*, is the dewatering that might be required during excavation of the coal unloading facility. *However*, it was found, through the groundwater model, that this would involve only slight changes in surface or groundwater flows for a short time period. The construction of the new facility would have no adverse impact on groundwater quality because BMPs would be followed during construction activities.

**Operation Impacts.** Protection of groundwater quality would be accomplished by storing coal, coke, and limestone in concrete or steel enclosures and using protective double liners for liquid waste (blowdowns from both the boiler and cooling tower circulating water systems) impoundments. Coal would be delivered via a covered handling system equipped with a sump to reclaim and recycle any water used for dust suppression. Chemical and petroleum product and hazardous waste storage facilities and handling procedures would be designed to prevent *or contain* accidental spills. In addition, the new evaporation pond would be double-lined making it unlikely that seepage would occur.

Increased groundwater withdrawals from water-supply Well #3 during projected plant operations were simulated by increasing the pumping rate from the original 164 m<sup>3</sup>/day (5,800 ft<sup>3</sup>/day) to the proposed 600 m<sup>3</sup>/day (21,200 ft<sup>3</sup>/day; 30 gpm to 110 gpm). This pumpage rate pushed the well almost to its reported capacity. For Layer 1, the drawdown occurred only south of the river, with a maximum of 0.05 meters (0.16 feet). For Layer 2, the drawdown had a maximum of 0.07 meters (0.24 feet), most of which occurred within a radius of 457 meters (1,500 feet). Layer 3 experienced a 0.26-meter (0.85-foot) drawdown in a radius of approximately 305 meters (1,000 feet). Layer 4 was apparently isolated from this influence and experienced only a 0.02-meter (0.075-foot) maximum drawdown, but the cone of depression was spread over a large area.

To evaluate the impact of increased groundwater withdrawal on adjacent well owners, a conservative modelling scenario was assumed whereby groundwater would be withdrawn at a rate equal to the entire SPPCo. groundwater right, and the entire withdrawal would be from water supply Well #3. Results from this simulation showed that the area affected by drawdowns of more than 0.03 meters (0.1 foot) would be quite small (less than a radius of 457 meters (1,500 feet) from the well), with a maximum drawdown, away from the immediate vicinity of the well, of less than 0.06 meters (0.2 feet).

Since there are no projected changes in the operation of the cooling pond as a result of the proposed project, there would be no net change in groundwater availability in the vicinity of the cooling pond. Therefore, there would be no change in the level of impacts to groundwater flow. Additionally, because groundwater flow from the cooling pond would not be dramatically increased, impacts to groundwater quality would not be adverse.

#### **4.1.4.4 Floodplains**

The only feature of the proposed Piñon Pine Power Project planned within the 100-year floodplain (as designated by the FEMA) would be the expansion of the existing switchyard (see Figure 4.1.4-1). Changes to the topography as a result of grading and filling are not reflected on the FEMA map.

The electric switchyard required for connection of the proposed units would be approximately 6.9 square meters (75 square feet) in size. The switchyard would contain switches and disconnects, circuit breakers; metering equipment; telemetry; buswork; supporting steel; concrete pads and footing; and transmission line connections. A grounding grid of copper wire would be placed in a trench beneath the switchyard expansion and connected to supporting steel and the fence. The site would be graded level with fill. The soil would be compacted and covered with 7.6 cm (3 inches) or more of gravel. The gravel would extend at least 61 cm (2 feet) beyond the fenceline. The fence would be a 6-foot chain link, topped with barbed-wire for safety and security.

The proposed switchyard would be needed to provide an electrical connection between the proposed Piñon Pine Power Project and SPPCo.'s existing electrical system. The switchyard would be sited adjacent to, and would expand upon, the existing switchyard for the Tracy Station Plant. Relocation of this facility would result in an increased cost for construction and operational difficulties for the existing and planned facilities.

**Construction Impacts.** Construction activities in the FEMA-designated 100-year floodplain would require the use of BMPs to minimize runoff and sedimentation. The relatively small size of the proposed switchyard would result in minimal potential impacts during construction, because the construction area would be limited in size. A Floodplains Notification, as required in 10 CFR Part 1022, was prepared as part of the Notice of Availability for the Draft EIS *and included* in the Federal Register (59 FR 27266).

Table 4.1.11-3. Sound levels of proposed project equipment.

Description	Sound Level at 50 feet (dBA)
Power Block:	
Combustion turbines (CT) <sup>1</sup>	80
Heat Recovery Steam Generator (HRSG) <sup>1</sup>	78
CT exhaust stack <sup>1</sup>	74
Boiler feedwater pump <sup>3</sup>	72
Steam turbine/generator <sup>3</sup>	75
Coal crusher <sup>3</sup>	86
Cooling Tower <sup>3</sup>	81
Gasifier Equipment <sup>2</sup>	88
Gasifier Vents <sup>2</sup>	87
Coal Unloader <sup>3</sup>	81
Locomotive <sup>4</sup>	71
Flare Stack	87
Sources:	
1 Vendor.	
2 Adams, 1989.	
3 BBN, 1978.	
4 Swing and Pies, 1973.	

equipment and 87 dBA for the combined vents at the top of the plant (*Adams, 1989*). The vents would operate intermittently. The flare stack, which would only operate briefly during gasifier plant start-up, shutdown, and upset conditions, would produce a noise level of approximately 87 dBA at 15 meters (50 feet).

The coal unloader noise is based on a bottom dump unloader with a car shaker for unloading frozen coal (*BBN, 1978*) and assumes the unloader is enclosed in an uninsulated shed with openings at each end for the train and other openings in the sides for ventilation. However, a car shaker may not be used; and in this case, the unloading noise would be inconsequential. Noise from the idling locomotives (*Swing and Pies, 1973*) would be about 10 dBA lower than other plant noises and would not be significant.

**Table 4.1.11-2. Estimated noise levels at receptor locations.**

Construction Phase	Equivalent Sound Level (dBA)		
	Tracy Station Boundary 1/2 mile west	Nearest Residence 1 mile west	Community of Patrick 3 miles west
Excavation	54	44	28
Concrete Pouring	50	40	24
Steel Erection	54	44	28
Mechanical	49	39	23
Clean-up	44	34	18
Steam blowing* (un-muffled)	83	73	57

\* Instantaneous steam blowing levels would be about 18 dBA higher.

**Operation Impacts.** Potential noise impacts have been assessed for the nearest residence at a distance of 1.6 km (1 mile) and for the residences in the community of Patrick about 4.8 km (3 miles) from the site. Noise levels also were modeled at the nearest site boundary to determine compliance with the Storey County noise ordinance limit. Both continuous and intermittent sources of noise resulting from operation of the proposed Piñon Pine Power Project have been assessed. Additional information is provided in the Health, Safety, and Noise Technical Report, available in the reading rooms (see Appendix H).

Predicted noise levels were compared with the EPA guideline day/night noise level ( $L_d$ ) of 55 dBA (EPA, 1974). This level does not represent a noise standard but is a guideline level that was developed without regard to cost or feasibility of compliance. The EPA document points out that a large portion of the population currently lives in much higher level noise environments, particularly in urban areas. However, even in rural areas, residences located adjacent to railroads and highways typically experience  $L_d$  levels well above 55 dBA. The predicted levels also are combined with the existing  $L_d$  levels to determine the expected net increase in noise levels at the receptor locations.

A complete listing of proposed plant equipment and associated sound levels at a reference distance of 15 meters (50 feet) from the acoustic center is presented in Table 4.1.11-3. The gasifier plant would be the loudest source of continuous noise with a level of 88 dBA at 15 meters (50 feet) for the lower level

Table 4.1.11-1. Construction equipment and estimated composite site noise levels.

Construction Phase	Loudest Construction Equipment	Maximum Equipment Noise Level @ 50 feet (dBA)	Composite or Average Site Noise Level @ 50 feet (dBA)
Excavation (including piling)	Pile driver	101	89
	Dump truck	91	
Concrete Pouring	Truck	91	78
	Concrete Mixer	85	
Steel Erection	Derrick Crane	88	87
	Jack Hammer	88	
Mechanical	Derrick Crane	88	87
	Pneumatic tools	86	
Clean-up	Rock Drill	98	89
	Truck	91	
Steam Blowing	Steam blowing vent (unmuffled)	110 @ 1,000 feet	92 @ 1,000 feet

Source: EPA, 1971; Barnes et al., 1976.

The temporary (1- to 2-week period) and short-duration (about 2½ minutes each) steam blowing activity would produce audible levels of noise. Instantaneous steam blowing levels would be about 91 dBA at the nearest residence and about 75 dBA in Patrick. These levels could temporarily disrupt outdoor conversations and arouse concern that an unusual and possibly dangerous situation exists at the Tracy Power Station. Prior to the initiation of steam blowing, letters of explanation would be sent to the nine residences in the area to avert the potential concern that a problem may exist at the power plant. These high levels at night would likely cause sleep interference at the nearest residence. Because of this, the noise impact would be significant during the 1- to 2-week period. In the past, SPPCo. has mitigated the impact by temporarily relocating the affected residents to a hotel in the Reno/Sparks area. The same offer would be made for this project. The Storey County Building Department has indicated that this would be an acceptable mitigation measure (see Appendix B). Although steam blowing could potentially violate the Storey County noise ordinance, a Storey County Building Department official stated that because it would be temporary and of short duration, exceeding the ordinance for this activity would not be a significant impact (*personal communications with John Palmer, April 5, 1994*).

**Construction Impacts.** Noise would be produced during the 26-month construction period at varying levels depending upon the construction phase. Construction of power plants and other industrial facilities can generally be divided into five phases that use different types of construction equipment and produce different amounts of noise: (1) excavation; (2) concrete pouring; (3) steel erection; (4) mechanical; and (5) cleanup. An activity known as "steam blowing" would be conducted during the cleanup phase just prior to full plant start-up. This activity would have the potential to create the most noticeable noise during the entire construction period. In addition, if necessary, some blasting may occur during excavation.

Both the EPA Office of Noise Abatement and Control and the Empire State Electric Energy Research Company have studied noise from individual pieces of construction equipment as well as from construction sites of power plants and other types of facilities (*EPA, 1971; Barnes et al., 1976*). Use of this information is conservative because it is between 16 and 21 years old; the evolution of construction equipment has been toward quieter designs as the country becomes more urbanized and populations become more aware of the adverse effects of noise.

The noisiest equipment types (for 1971 vintage equipment) that generally would be operating at a site during each phase of construction are presented in Table 4.1.11-1. The composite average or equivalent site noise level, representing noise from all equipment taking into account the varying use rates, is also presented in the table for each phase. Additional information on noise is provided in the Health, Safety, and Noise Technical Report, available in the reading rooms (see Appendix H). The highest level of any individual piece of equipment would be a peak level of 101 dBA at 15 meters (50 feet) for an impact-type pile driver.

Average or equivalent construction noise levels projected at the Tracy Power Station boundary and the nearest residences are presented in Table 4.1.11-2. These values were interpolated/extrapolated from construction noise contours presented by Barnes et al. (1976) for a typical power plant construction site. Levels during normal construction activities are projected to be between 44 and 54 dBA at the site boundary and 34 and 44 dBA at the nearest residence located about 1.6 km (1 mile) west of the site. The predicted levels at the residence would be significantly below the existing daytime ambient levels and would generally be inaudible. The projected levels in the community of Patrick are so low, they would not be heard, even at night.

External radiation from these sources is undetectable outside a 3-meter (10-foot) radius and would not add any detectable increase to the normal background radiation dose received by a member of the general public during his or her lifetime. While the accumulated dose from these sources would not be expected to exceed the federally mandated whole-body dose of 1.25 REM (Roentgen Equivalent Man) per calendar quarter, it is theoretically possible for persons working with these materials to receive in excess of 25 percent of the allowable dose, thus mandating the use of personal dosimeters (10 CFR 20.202). To determine the requirements for dosimeters and any other protective equipment if these radiation sources are used, radiation safety surveys would be required in the areas where employees may be working with these materials. Until the results of these surveys are known, all employees required to work with these sources would be required to wear personal dosimeters and to adhere strictly to the procedures established for working with these materials. These employees also would be trained to fulfill the requirements of 10 CFR 19.12 and 29 CFR 1910.96. An individual knowledgeable in health physics and radiation safety would be designated as the Radiation Protection Officer for the project. This person would be responsible for supervising the use of these radiation sources, conducting the testing required by the permits, ensuring that employees working with these sources receive the proper training in their use, and providing technical advice to the Incident On-Scene Commander in the event of an emergency involving these sources.

If a radiation source becomes unusable or the permit for its use expires or is revoked, the source would be packaged for shipment in accordance with the requirements of 49 CFR Part 173, and the site where the source was used would be surveyed in accordance with the requirements of 10 CFR 30.36. The source would be shipped to a radioactive waste disposal facility licensed by the U.S. Nuclear Regulatory Commission (NRC) or a state delegated this authority by the NRC. With strict adherence to regulatory requirements and permit conditions, no adverse environmental impact would be expected from the use of these sources.

### **4.1.11 Noise**

Construction noise is a typical impact to workers and is intermittent and short-term. Noise as it applies to worker health is discussed in section 4.1.9; noise as it affects wildlife is discussed in section 4.1.6. This section describes potential impacts to the surrounding area from noise generated during construction and operation of the proposed Piñon Pine Power Project.

The proposed Piñon Pine Power Project would use small quantities of hazardous chemicals during routine operations. These materials would include such substances as paints, solvents, and lubricants for maintenance and cleaning. In addition, chemicals (e.g., silver nitrate, glycerine, potassium, sulfuric acid, nitric acid, methanol, ethanol, potassium chromate, and sodium hydroxide) could be used in a laboratory setting. Because of the small quantities (e.g., less than CERCLA reportable quantities) that would be stored on site and the relative remoteness of the Tracy Station site, the hazardous chemicals would not be expected to pose any threat to public health and safety. Additionally, any threat to public health and safety resulting from a spill or other accidental release of these materials would be further minimized through the use of secondary containment, containment piping, leak detection, and other techniques to contain a release. The containment site would consist of a concrete slab surrounded by a concrete berm. All concrete would be treated so that it is impervious and chemical resistant. Where possible, waste would be packed in drums for storage within the site; actual characteristics and prescribed measures would be developed during plant engineering and design.

The Chemical Emergency Response Plan for the Tracy Power Station would be modified prior to the start-up of the proposed Piñon Pine Power Project to incorporate the new facilities and processes of this project. As discussed in section 3.10, the plan currently includes the requirements of a Spill Prevention, Control and Countermeasures Plan (40 CFR Part 112); a Hazardous Waste Contingency Plan (40 CFR Part 264); a Facility Emergency Evacuation and Fire Fighting Plan (29 CFR 1910.38); and a Chemical Emergency Response Plan [29 CFR 1910.120(q)].

Because of their close proximity to these chemicals, workers potentially face the greatest impact from their use. To ensure that employee exposure to these substances would not exceed the standards allowed by the OSHA or the National Institute of Occupational Safety and Health (NIOSH), the SPPCo. Industrial Hygienist would determine requirements for personal protective equipment, modified work practices, engineering controls, and/or administrative controls. Until instructed otherwise, all employees in affected work areas would wear the personal protective equipment prescribed by the SPPCo. Industrial Hygienist. Adverse impacts on worker health and safety would be minimized, provided the workers using these chemicals follow the guidelines on chemical usage, the protective equipment requirements, and the procedures to be followed.

The proposed Piñon Pine Power Project probably would use sealed low-level radiation sources containing byproduct materials such as Cesium-137 (a beta-gamma radiation emitter) and Radium-226 (an alpha-gamma radiation emitter) in process control sensors for coal, limestone, and LASH handling.

Table 4.1.10-3. Steam generator cleaning/boiler feedwater treatment chemicals.

Chemical	Formula	CAS Number	SARA 302 TPQ (lb)	CERCLA RQ (lb)	SARA 313
Eliminox	proprietary	---	---	---	no
Ammonia	NH <sub>3</sub>	7664-41-7	500	100	yes
Trisodium phosphate	Na <sub>3</sub> PO <sub>4</sub>	7601-54-9	---	5000	no
Disodium phosphate	Na <sub>2</sub> HPO <sub>4</sub>	7558-79-4	---	5000	no
Hydrochloric acid	HCl	7647-01-0	---	5000	yes
Ammonium bifluoride	NH <sub>4</sub> HF <sub>2</sub>	1341-49-7	---	100	no
Ethylenediamine- tetraacetic acid	(HOOCCH <sub>2</sub> ) <sub>2</sub> NC H <sub>2</sub> CH <sub>2</sub> N(CH <sub>2</sub> CO OH) <sub>2</sub>	60-00-4	---	5000	no
Sodium hydroxide	NaOH	1310-73-2	---	1000	no
Sulfuric acid	H <sub>2</sub> SO <sub>4</sub>	7664-93-9	1000	1000	yes

Appendices A and B). Releases of CERCLA hazardous substances in quantities equal to or greater than their reportable quantity (RQ) are subject to reporting to the National Response Center under CERCLA. The column in Table 4.1.10-3 labeled "CERCLA RQ" identifies the reportable quantities where applicable (40 CFR Part 302, Table 302.4). Emissions or releases of SARA 313 Toxic Chemicals must be reported annually as part of SARA Title III's community right-to-know provisions. The column labeled "SARA 313" identifies which chemicals are subject to these annual reporting requirements.

Appropriate containment structures would be constructed around chemical or petrochemical storage tanks to avoid entraining spillage of those compounds in surface runoff. Surface runoff draining from areas of industrial activity (material shipping/receiving areas, waste and raw materials storage areas, on-site access roads) would be directed through a filter or separator treatment device capable of removing entrained pollutants. Solid and liquid wastes retained by treatment devices would be disposed of periodically, depending on maintenance requirements. Either a hazardous waste disposal contractor or used-oil recycler contractor would remove the waste material for disposal in compliance with the pertinent Federal, state, and local environmental regulations. The discharge of non-stormwater (process water or floor drains) from the proposed unit would be directed to the *double*-lined evaporation pond to prevent co-mingling with stormwater.

would be performed in accordance with all applicable regulatory requirements and safety guidelines. Waste chemicals generated during facility maintenance and meeting the definition of a hazardous waste (as defined in 40 CFR Part 261) would be managed as hazardous wastes in accordance with Federal, state, and local regulatory requirements. Chemical cleaning of the boiler would occur infrequently and not more than once every 5 to 10 years.

Boiler feedwater treatment would be an important part of the process to maintain proper water chemistry, reduce corrosion, and reduce the buildup of scale and deposits on steam generator piping. The chemicals used for treating the boiler feedwater generally would be consumed or neutralized during the water treatment process or the steam cycle and would not present a hazard when discharged as *de minimis* constituents of the boiler blowdown; they would not be regulated as hazardous waste. This discharge would be routed to the new evaporation pond where it would evaporate, similar to the blowdown from the other three operating units at the Tracy Power Station.

Ion exchange columns would be used to demineralize the water. The resins in the ion exchange columns must be regenerated periodically with 4 percent caustic (NaOH) and 4 percent sulfuric acid (H<sub>2</sub>SO<sub>4</sub>). The wastewater from this process would be neutralized and discharged to the evaporation pond. Currently, chlorine gas is used as a biocide in treating condenser cooling water feedwater; however, use of chlorine gas is being replaced. Nalco's "Eliminox" or erythorbic acid solutions are added to the boiler feedwater as an oxygen (O<sub>2</sub>) scavenger. Morpholine (C<sub>4</sub>H<sub>8</sub>ONH) is typically used for pH control in the steam cycle. At steam generator operating temperatures, morpholine partially decomposes to form other organic compounds (formic and acetic acids) and carbon dioxide (CO<sub>2</sub>). Transportation, storage, and handling of each of these chemicals would be performed in accordance with all applicable regulatory requirements and safety guidelines. Waste chemicals generated during facility maintenance and meeting the definition of a hazardous waste (as defined in 40 CFR Part 261) would be managed as hazardous wastes in accordance with Federal, state, and local regulatory requirements.

A list of chemicals that could be used for steam generator chemical cleaning and/or boiler feedwater treatment are presented in Table 4.1.10-3. A side-by-side comparison of the regulatory reporting requirements for each of these compounds is presented. The Chemical Abstract Service (CAS) registry number is included for chemical identification and cross-referencing purposes. The presence of extremely hazardous substances (EHS) in quantities in excess of the Threshold Planning Quantity (TPQ) requires certain emergency planning activities to be conducted. The column in Table 4.1.10-3 labeled "SARA 302 TPQ" identifies threshold planning quantities where applicable (40 CFR Part 355,

the applicable provisions and restrictions of 40 CFR Part 721 and 40 CFR 723.250. In addition, these zinc and nickel compounds are classified as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. Emissions or releases of zinc compounds and nickel compounds also are subject to the annual reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372. Some of the zinc-based desulfurization sorbent would, through attrition, wind up in the sulfator with the LASH material and thus would require disposal in either a solid waste facility or a hazardous waste facility. The waste classification would depend upon the form of zinc and nickel found in the waste. Analysis (including TCLP) would be conducted to characterize the wastes in order to determine the appropriate method of disposal.

Transportation, storage, and handling of the sorbent would be performed in accordance with all applicable regulatory requirements and safety guidelines. When handling the sorbent, care would be taken to avoid exposure by requiring that personal protective equipment be worn, including disposable garments and impervious gloves, to prevent skin contact; chemical goggles or a full face shield for eye protection; and an approved air-purifying or air-supplied respirator for respiratory protection. Airborne exposure to the dust would be maintained at less than  $1.0 \text{ mg/m}^3$ .

Chemical cleaning of the steam generator piping would be required following original construction of the system. First, the pressure parts in the steam generation system would be subjected to hydrostatic pressure testing to ensure that there are no leaks in the system. (The water used for this process is typically demineralized, deaerated water.) An oxygen scavenger would be added; enough ammonia ( $\text{NH}_3$ ) also would be added to give a pH of approximately 10. Following a successful pressure test, the system would be flushed and given an alkaline boilout to remove debris, oil, grease, and paint. This boilout typically would be accomplished with a combination of trisodium phosphate ( $\text{Na}_3\text{PO}_4$ ) and disodium phosphate ( $\text{Na}_2\text{HPO}_4$ ).

Although standard water treatment practices would be followed, the internal surfaces of boiler water side components (including supply tubes, headers, and drums) would accumulate deposits as hard scales or porous deposits. These deposits would reduce heat transfer rates and would need to be removed periodically through a chemical cleaning process. Typical solvents used for this process would include inhibited 5 to 7.5 percent hydrochloric acid ( $\text{HCl}$ ) with ammonium bifluoride ( $\text{NH}_4\text{HF}_2$ ) added as necessary to improve penetration of deposits, or a chelating agent, such as inhibited ammonium salts of ethylenediaminetetraacetic acid (EDTA). Transportation, storage, and handling of each of these chemicals

Table 4.1.10-2. Expected quantities of coal fines collected for consumption as a fuel.

Process	Schedule	Flow Rate (lbs/hr)
Train unloading system, including coal silo feed	3 hrs/week	8.9
Crushing, screening, silo filling	8 hrs/day	3.1
Gasifier feed system	24 hrs/day	1.0
LASH handling system	24 hrs/day	0.2

of the Lockwood landfill, if a reuse option for LASH cannot be implemented, would be diminished, at most, by less than 2 percent, which would not be considered a significant impact.

Small quantities of hazardous wastes are anticipated from operation of the project. These include acetone, spent non-halogenated solvents, and waste oil. Generators of hazardous waste that store the waste are required to obtain an identification number from the NDEP. The Tracy Power Station has an existing EPA generator identification number and has experience with handling these kinds of wastes, including recordkeeping, labeling, manifesting, and reporting requirements. Hazardous wastes would be transported by a licensed transporter and disposed of at a permitted facility.

Although the quantities of non-recyclable hazardous waste produced cannot be determined until the plant is operational, attempts currently are being made to replace hazardous materials with non-hazardous materials and prevent resulting pollution. For example, the Tracy Power Station is using non-hydrazine oxygen scavenger chemicals for steam cycle corrosion control. Use of hydrazine (a carcinogen) has been discontinued and replaced with carbohydrazide- or erythorbic acid-based oxygen scavengers. Use of these or similar non-hydrazine materials also would be used for the proposed Piñon Pine Power Project. Gaseous chlorine currently is used for cooling water treatment for the control of algae and other biological growth. Use of gaseous chlorine is being discontinued and replaced with water soluble solid or liquid bromine/chlorine materials. These two examples illustrate SPPCo.'s efforts to replace hazardous materials with less hazardous materials.

A zinc-based desulfurization sorbent, to be used as a catalyst in the external coal gas desulfurization vessels, would be returned to the manufacturer for refurbishing and reuse or disposed of in an approved landfill. The zinc-based desulfurization sorbent would contain zinc and nickel compounds listed in the Toxic Substances Control Act (TSCA) Inventory of Chemicals, and would be subject to all

by Refuse, Inc. It is a Class I, *Part 258-approved* landfill permitted to receive both municipal and non-hazardous industrial wastes. The Lockwood landfill has a life expectancy of 122 years based on the assumption that 8,000 tons of solid waste would be received daily. Currently, the landfill is averaging 2,300 tons of solid waste per day. Consequently, at most, the maximum of 134 tons/day of solid waste generated by this proposed project would reduce the lifespan of the landfill 1 year for every 60 years of operation. However, if disposal continues at the current rate, solid waste from the proposed project would have no impact. The disposal cost to the project for use of the landfill would be about \$2.00/ton of solid waste, provided that SPPCo. arranges its own transportation (*Ebasto, 1993c*).

Other solid wastes generated by the proposed project would include barrier filters and spent sorbent from the external hot gas desulfurization vessels. Barrier filters would be used to remove particulates from the coal gas. In the process, it is likely that the filters would capture some of the trace metals from the coal; therefore, analytical testing would be performed to determine if the filters contain any hazardous constituents to ensure that they would be disposed properly.

Handling, storage, transportation, and disposal of the barrier filters would be performed in accordance with all applicable regulatory requirements and safety guidelines. Although the barrier filters are exempted from regulation as a hazardous waste by 40 CFR 261.4(b)(4), landfill operators have the right of refusal if they believe the materials are hazardous or could present a future liability. If the filters are determined to be hazardous by analytical testing, then they would be disposed of at an approved hazardous waste landfill, such as the U.S. Ecology Inc. facility located in Beatty, NV. Transportation of these wastes would be performed in accordance with all applicable NDOT regulations.

Coal fines would be collected and consumed as fuel in the gasifier and, therefore, would not present a disposal problem. Air from the coal and limestone crushing, conveying, and storage areas would be collected with hoods or covers under negative pressure and would be exhausted through pulse jet, bin-type fabric filters, with a particulate emissions level of less than 0.02 grains per dry standard cubic foot of air. The quantities of coal fines expected to be collected and returned to the coal storage/handling system for consumption as fuel in the gasifier are presented in Table 4.1.10-2.

Compliance with all aforementioned Federal, state, and local regulations, implementation of health and safety procedures, and adequate maintenance of engineering features would result in minimal impacts from solid waste generated during operation of the Piñon Pine Power Plant. The life expectancy

**Table 4.1.10-1. Potential industrial uses of LASH materials.**

Industrial Use Option	Stage of Development
Pozzolanic material used in cement manufacturing	Developed
Sheetrock (wallboard) manufacturing	Developed
Soil amendment and subgrade material for roadbeds	Developing
Soil conditioning	Developing
Backfill for the mining industry	Developed
Landfill cover	Developed
Stabilization of hazardous wastes	Potential
Manufacturing mineral wool	Potential
Absorbent for oil spills (silicone coated)	Potential
Filler material in plastics	Potential
Removal of heavy metals from industrial waste waters	Potential
Neutralization of acid waste effluents	Potential
Flux in steel manufacturing	Potential
Sewage treatment (phosphate removal, pH control)	Potential
Quick-setting cements	Potential
Glass manufacturing	Potential
Portland cement retarder	Potential
Tile and plaster	Potential
Source of sulfur and sulfuric acid	Potential
Drying industrial gases, solids, and many organic liquids	Potential
Polishing powders	Potential
Dyeing and calico printing	Potential
Metallurgy (reduction of zinc minerals)	Potential
Desiccant	Potential

However, until a final decision on reuse is reached, the planned procedure for LASH disposal would be to transport it daily to a nearby landfill by truck. Approximately seven truck trips per day (or 50 trips per week) would be required. The silo would be equipped with a rotary underloader equipped with discharge valve and a telescope loading chute to minimize dusting during the truck loading operation. The most likely location for LASH disposal would be the Lockwood landfill located 19.3 km (12 miles) west of Tracy and 8 km (5 miles) east of Reno near Lockwood in Storey County. This landfill serves Washoe County and the cities of Reno and Sparks and is currently operated for Washoe County

Only small quantities of hazardous wastes would be generated during construction of the proposed facility. No impacts from hazardous or toxic materials are anticipated.

**Operation Impacts.** LASH is a mixture of spent limestone and coal ash and is the primary solid waste produced by the proposed coal gasification process. Up to a maximum of 134 tons/day of cooled LASH would exit the fluidized-bed sulfation combustor and would be conveyed continuously to the solid waste storage silo using a covered belt conveyor system. The storage silo, with a 5-day storage capacity, would be designed to prevent rainwater runoff from contacting the LASH and wind from dispersing LASH particles into the environment.

Washoe County requires that the LASH pass the Toxic Characteristic Leaching Procedure (TCLP) test associated with the Resource Conservation and Recovery Act (RCRA) requirements before the material can be landfilled at the Lockwood site. Although it is expected that the LASH would be able to pass the TCLP test, improved means of disposal are being investigated (see *section 4.3.2.3*).

LASH also has significant potential for reuse. Various uses for the LASH and resulting environmental impacts are being evaluated. The results of these evaluations would be used to determine the most cost-effective residuals management solution, consistent with all applicable laws, ordinances, regulations, and standards. It is believed that reuse, rather than disposal, would not only reduce environmental consequences but also may result in significant savings because LASH constitutes most of the waste produced. There are a number of possible industrial uses for LASH. A list of these possible uses with an indication of the stage of commercial development of the option is presented in Table 4.1.10-1. Many of the possible uses indicated would have to be considered theoretical rather than common practice, and would require a significant amount of preprocessing. However, a number of these alternatives would require little or no preparation, and appear to be very promising.

For each alternative, it would be essential that the LASH be fully tested and characterized to assure that it meets the physical and chemical property requirements associated with a particular reuse alternative. Also, the material would need to be tested at a regular frequency to assure product quality. In the case of some alternatives, demonstrations would need to be performed. Independent evaluations of test results by third-party review (e.g., research institution review) also would be desirable to assure the widest possible market for the material. Further discussion of the possible reuse options and SPPCo.'s plan to explore this can be found in *section 4.3.2.3*.

of magnetic fields is commonly measured in units called gauss; a milligauss is one-thousandth of a gauss. Estimates of magnetic field strength (mG) at the edge of the right-of-way for average power flow range from 4.0 to 46.1 mG [compared to magnetic fields of 4.8 to 110 mG for clothes dryers at 10 cm (4 inches); 4.8 to 100 mG for televisions at 10 cm (4 inches); and 5.2 to 17 mG for blenders at 30.5 cm (1 foot)]. Aggregate estimates on the transmission system, which would serve the proposed Piñon Pine Power Project show an increase of 6.9 mG at the edge of the right-of-way after the project becomes operational.

Currently, there are no EMF-related OSHA regulations that govern workers at electrical power generation facilities. However, SPPCo. would comply with other OSHA guidelines for employee safety and health protection for this proposed project.

Personnel working in areas where EMF values tend to be higher would be exposed for only short durations. Since EMF attenuates with distance from the conductors, other workers would receive much less exposure. Because the health issues are unresolved, the human health effects of EMF from the proposed facility cannot be fully evaluated at this time.

#### **4.1.10 Hazardous and Toxic Materials/Waste Management**

This section describes potential impacts from the handling, storage, transportation, and disposal of solid and hazardous waste. Compliance with applicable Federal, state, and local requirements for solid and hazardous material management would ensure minimal impact.

**Construction Impacts.** SPPCo. would be responsible for storage and disposal of all hazardous and solid wastes generated by the construction of the proposed facilities.

Stipulations for the handling and transportation of solid wastes would be included in the Special Use Permit for the proposed Piñon Pine Power Project. Trash and residue from construction would be disposed off-site in the nearby Lockwood disposal facility. Disposal of all solid wastes would be in accordance with Nevada, Storey County, and Washoe County requirements at the time of construction. If the Lockwood landfill receives 8,000 tons/day or less of solid waste, it will remain open for 122 years. Currently, the landfill is averaging approximately 2,300 tons/day. Consequently, no impact from solid waste generated during construction would be anticipated.

function of the amount of current carried by the line and the height of the conductors. EMF typically is attenuated with distance from the conductors. Therefore, EMF would vary along a transmission line right-of-way. All devices that carry electric current, such as televisions, radios, computers, and home lighting, are sources of EMF.

There is some epidemiological evidence that suggests an association between magnetic field exposures and certain types of cancer (*Padgett et al.*, 1993); however, though the body of evidence cannot be dismissed, it is not complete enough to draw meaningful conclusions (*EPA 1992c*). Currently it is not known whether certain magnitudes of EMF are safer or less safe than other levels. With most chemicals, it is assumed that exposure at higher levels is worse than exposures at lower levels. This may or may not be true in the case of EMF. The basic nature of the interaction between EMF and biological processes is still not understood, and because of this, it is considered inappropriate to make generalizations about the exposure-response relationship between EMF and certain cancer outcomes (*EPA 1992d*). Also, other health effects have not been studied as extensively as cancer effects, so it is even more uncertain if there are any noncarcinogenic health risks associated with EMF.

**Construction Impacts.** No increase in electromagnetic fields would be anticipated during the 26-month construction period.

**Operation Impacts.** A new switchyard would be constructed adjacent to existing switchyards to provide the electrical connection between the proposed Piñon Pine Power Project and SPPCo.'s existing electrical system. Connection to the existing transmission system would be through tie and service breakers feeding unit-type transformers connected to the combustion turbine and steam turbine generators. The generators would be rated at 13.8 kV. The transformer base rating would be approximately equal to the generator net output. The elevated temperature and/or the auxiliary cooling transformer rating, would be approximately equal to the maximum generator output. Station service power would be fed from one or both generator transformers or an auxiliary station service transformer supplying 4.16 kV to large motors and to 4.16 kV to 480 volts (V) step-down transformers for general distribution. This project would require no new or additional transmission lines; it would use only existing transmission lines. Additional generation from the proposed Piñon Pine Power Project would result in a decrease of generation at the North Valmy Station. The line loadings on the Valmy 345 kV line and the other 345 kV lines at the Tracy Station Plant also would be decreased. There would be no incremental voltage change on transmission lines at the Tracy Station Plant because system voltage would be controlled and kept substantially at the same levels as currently maintained. The strength or intensity

The chemical analytes of the existing evaporation pond were reviewed to determine potential health impacts to workers and individuals in the vicinity of the proposed new evaporation pond from water sprayed by the floating spray units. Assuming that the spray generated by the floating spray units would not migrate beyond the boundary of the pond, no adverse impacts would occur to workers or individuals in the vicinity of the pond. An assessment also was conducted to determine the impacts to workers from breathing vapors from the pond spray. The vapor pressure, molecular weight, and the solubility of the chemical constituents of the evaporation pond were evaluated to determine the types and concentrations of chemicals that would occur in the vapor stage. These concentrations for the chemicals of concern were compared to time-weighted average concentration (for 8-hour workday, 40-hour week) threshold limit values developed by the American Conference of Governmental Industrial Hygienists. All chemicals of concern were determined to be below the threshold limit values.

Consequently, even with the unique concerns from the addition of the Piñon Pine Power Project, the proposed project would not be expected to adversely impact worker health and safety. Existing health and safety programs (see section 3.9) would be modified to include new process concerns and potential health and safety considerations. Also, engineering controls would be designed to adequately minimize any potential impacts that may pose a risk to worker health and safety.

Additionally, no impact to the general public's health and safety would be expected from operation of the proposed project. The occupied residence closest to the site is approximately one mile away. Unauthorized personnel would continue to be prevented from entering the Tracy Power Station site and facilities of the proposed Piñon Pine Power Project by a perimeter fence that surrounds the property. For added security and safety, additional fences would surround several site facilities. This would reduce possible impacts to unauthorized personnel and the possible impacts to workers because of unauthorized personnel. In addition, in the unlikely event of an accident, the implementation of the Chemical Emergency Response Plan (see section 3.9) would ensure that proper notification and evacuation procedures would be followed. Additional worker and public health and safety issues are discussed in section 4.1.10 (Hazardous and Toxic Materials/Waste Management).

#### **4.1.9.1 Electromagnetic Fields (EMF)**

Today, there is limited scientific understanding of the potential health risks from 60 Hertz (Hz) electromagnetic fields (EMF) exposure. Electric fields associated with transmission lines are a function of voltage carried by the conductors and the conductor height aboveground: magnetic fields are a

Table 4.1.9-1. Projected chemical composition of the LASH.

Component	Weight (%)	Lb/hr
<u>SOLIDS</u>		
Ash	97.40	6,619
Carbon	1.28	87
Oxygen	0.82	56
Nitrogen	0.50	34
Sulfur	0.01	0
<u>SORBENTS</u>		
CaO	36.14	4,015
CaS	6.25	199
CaSO <sub>4</sub>	24.50	781
MgO	1.34	148
Inerts	8.48	270
Total	100.00%	9,982

reflect this process, and a pro-active preventive maintenance program would be implemented to minimize the potential impacts to the workers.

Near-field or in-plant noise levels would be controlled by specifying equipment to produce a noise level not to exceed 85 dBA at 0.9 meters (3 feet) from the equipment. This measure generally would permit compliance with OSHA noise exposure regulations (29 CFR 1910.95) without hearing protection in many parts of the plant. However, it would be impractical to quiet some of the larger items to this low level. Each area around such equipment would be posted as a high noise level area and hearing protection would be required. The existing Tracy Power Station hearing conservation program would be extended to include the proposed Piñon Pine Power Project.

As discussed in section 3.9, an in-place site program is in full compliance with the Hazard Communication/Right-To-Know Program as promulgated by OSHA (29 CFR 1910.1200). All aspects of health and safety compliance monitoring are implemented. The program conforms to OSHA requirements, as well as to those of the state of Nevada.

to dust during maintenance and repair operations, however, strict adherence to the requirements in existing safety programs (e.g., respiratory protection, confined space entry) would minimize any potential worker impacts (see section 3.9).

Although there is some potential for fire or ignitability from the coal storage or coal dust build-up in the coal crushing and handling systems, workers would be trained on proper management and consequently, impacts to worker safety would be minimal. *The fire suppression system has not yet been designed but it would comply with all applicable specifications.*

The expected chemical composition of LASH is presented in Table 4.1.9-1. The lime (calcium oxide) in the LASH would react with water to form hydrated lime (calcium hydroxide) and would generate a considerable amount of heat. In addition, chronic exposure to dusts of silica and titania are reported to result in carcinogenicity. A material safety data sheet (MSDS) would be available to all workers. If required to handle LASH, workers would be trained in the proper handling of the material, instructed to avoid dust inhalation and exposure to the skin and eyes, and provided with appropriate personal protective equipment. Airborne exposure to the dust would be maintained at less than 1.0 mg/m<sup>3</sup>.

The processes of coal devolatilization, partial combustion, and gasification, along with LASH and spent-sorbent cooling, would occur in the gasifier island. Hydrogen sulfide (H<sub>2</sub>S) would be produced from the sulfur in the coals. Western coals with low sulfur content are the intended feed source except during a short-term test; therefore, the amount of H<sub>2</sub>S gas produced would be minimized. Also, H<sub>2</sub>S levels would be reduced by using limestone in the gasifier and zinc-based sorbents in an external process, which would convert the sulfur eventually to gypsum in the solid waste products. The limestone also would reduce the potential production of NO<sub>x</sub> compounds by inhibiting the production of ammonia. The fuel gas would contain H<sub>2</sub>, CO, H<sub>2</sub>S, and carbonyl sulfide (COS) in varying amounts. The gas would be produced at 300 psi and 538°C (1,000°F). Leak detection (area monitors) would be required at all flanges located in enclosed areas to minimize impacts to workers from potential leaks. In addition, hand-held leak detectors would be used by operators during leak detection and repair programs.

The design for desulfurization and sulfation takes into account control measures to minimize the potential release of toxic gases and, therefore, minimize potential impacts to the worker population. Concerns would be from potential leaks or process problems that could result in releases to the work environment. Adequate emergency procedures, enhancement of existing safety programs updated to

impacts to workers from heavy equipment operation and activities such as cutting metal or grinding operations potentially pose higher noise levels than during actual plant operations to the construction workers. The potential also exists for construction workers to be exposed to airborne emissions from routine activities. Exposures may be to heavy metals during welding, soldering, grinding, and painting (e.g., lead, chromium) or to organic vapors from painting or cleaning operations. These exposures would be intermittent, but may be intense and would be evaluated at the time of the construction phase. Appropriate health and safety measures would be implemented for all identified and anticipated hazards to worker health and safety. Consequently, the potential for adverse impacts to worker health and safety during the construction phase of this project would be minimized by implementation of existing programs (see section 3.9) and including additional measures as needed to protect against unique construction hazards.

During construction, portions of interior fences would be removed, however, the perimeter fence would remain intact. Additional fences would be constructed to secure new facilities (and to prevent encroachment on existing resources). The use of fences would continue to deter intrusion by unauthorized persons.

**Operation Impacts.** There are some unique safety considerations and impacts associated with the proposed Piñon Pine Power Project that may potentially affect worker populations.

Since coal currently is not used at the Tracy Power Station, there are additional associated safety concerns because of its use. The greatest potential concern would be accidental or emergency release of fugitive coal dust. The proposed project provides engineering controls to minimize fugitive dust, such as the use of bottom dump railcars in a negative pressure building. A dust filtration system also would be included in the design to minimize airborne dusts. Wastewater and wastewater sediments would be reclaimed, thus minimizing wastes and the potential for adverse impacts to workers from handling and disposing of waste materials.

Dusts generated from coal crushing and screening would be collected in negative pressure hoods that would be vented through a pulse jet or similar baghouse. This process would adequately control emissions and manage the potential impacts to workers in the area. A conventional lockhopper system would be used to pressurize the coal and limestone mixture prior to dumping. Additional safety considerations for high-pressure systems would be implemented to minimize potential impacts from the accidental release of pressure during normal operations. There may be the potential for worker exposures

*possible concerns and answer questions regarding the proposed project and the DEIS. On June 28, 1994, a meeting between SPPCo. and Tribal representatives was held at Nixon, NV. At the meeting, the Tribe was urged by SPPCo. to provide written comments to DOE regarding the project. SPPCo. called a Tribal Council member on two subsequent occasions to encourage the submission of written comments. Finally, on July 12, 1994, SPPCo. held a roundtable luncheon in Reno, NV with local business and community leaders to discuss the proposed Piñon Pine Power Project. Five Tribal representatives were present at the meeting (along with approximately 50 other business and community leaders). A presentation regarding general issues of the proposed project was made along with an opportunity for questions and answers.*

**Construction Impacts.** Construction of the proposed action would not *have disproportionately high or adverse human health or environmental effects on* low-income, minority, or Native American communities. All direct impacts are expected to occur on site, with little effect on surrounding areas of Storey or Washoe counties. As an Equal Employment Opportunity (EEO) company, SPPCo. would provide equal opportunities of employment for persons with the required skills.

**Operation Impacts.** Operation of the proposed project would not *have disproportionately high or adverse human health or environmental effects on* low-income, minority, or Native American communities. Coordination with the Pyramid Lake Paiute Indian Tribe, initiated before this project was proposed, would continue during project operation and beyond.

#### **4.1.9 Health and Safety**

This section describes potential impacts to worker health and safety from construction and operation of the proposed Piñon Pine Power Project. Existing health and safety programs would be modified to reflect unique safety considerations associated with the proposed project. Compliance with all applicable Federal, state, and local requirements for occupational health and safety would ensure minimal impact. In addition, potential impacts to the general public's health and safety are discussed.

**Construction Impacts.** Typical worker impacts present in the construction industry would be expected from the construction of the proposed Piñon Pine Power Project. During the construction phase of the project, a regimented field safety program would be instituted by Foster Wheeler, the prime construction manager. Foster Wheeler would be responsible for ensuring that regularly scheduled on-site safety meetings are conducted for all field personnel, including subcontractors. The potential noise

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**Operation Impacts.** The permanent workforce for the proposed project would be minimal (25 workers and families), and the presence of the proposed project would not remove or encroach upon any existing parks or recreational areas; therefore, no long-term adverse impacts on parks and recreation would be anticipated.

### 4.1.8.4 Environmental Justice

Environmental justice impacts would not be expected from implementation of the proposed action. The SPPCo.'s active communications with, and sensitivity to, Native American populations in the area and the lack of minority or low-income communities near the project site indicate that there would be no direct or indirect adverse impacts from the project on such communities.

The Industrial Participant for this project, Sierra Pacific Power Company (SPPCo.), has an established an ongoing relationship with the Pyramid Lake Paiute Tribe to provide information and discuss issues related to project planning. Dialogue with the Tribe takes place on a variety of issues and on a frequent basis. SPPCo. works with a Tribal Council-appointed point of contact, and has developed an "open door policy" with respect to providing information.

During the summer of 1992, the U.S. Department of Energy (DOE) held formal public scoping meetings *on the proposed project* in the community of Nixon on the Reservation and in the town of Fernley less than 16.1 km (10 miles) from the Reservation.

In January 1993, representatives of SPPCo. met with the Tribal Chairman to discuss the proposed project, the NEPA process, and the scoping meetings that were held for the project. In February, discussions continued with members of the Tribe's Water Resources Division and the Tribe's Water Resources Specialist. This meeting was used to discuss the status of the project and the NEPA process. An April meeting with the Tribal Council presented a slide presentation of the project and a report on the nature and type of technical documents that would be prepared for the project.

*After the Draft EIS was made available to the public on May 27, 1994, a DOE representative visited the Pyramid Lake Tribe on June 3, 1994, prior to the public hearing. The purpose of this visit was to discuss the hearing and the need for the Tribe to ask questions and to provide comments on the DEIS. On June 21, 1994, a public hearing on the DEIS was held at a meeting of the Tribal Council at Nixon, NV. On June 23, 1994, a representative of SPPCo. spoke with Tribal members to discuss*

Table 4.1.8-4. Projected water usage (acre-feet) at Tracy Station.

Year	With Project	Without Project	Difference *
1993	1,562	1,562	0
1994	1,643	1,643	0
1995	1,651	1,651	0
1996	2,622	2,622	0
1997	2,493	2,479	14
1998	2,843	2,259	584
1999	3,057	2,053	1,004
2000	2,924	1,906	1,018
2001	3,002	2,016	986
2002	2,987	1,945	1,042
2003	2,874	1,852	1,022
2004	2,768	1,741	1,027
2005	2,830	1,734	1,096
2006	2,779	1,550	1,229
2007	2,793	1,569	1,224
2008	2,742	1,526	1,216
2009	2,574	1,380	1,194
2010	2,730	1,533	1,196
2011	2,694	1,478	1,216
TOTAL	49,567	34,499	15,068

\* Water usage amounts at Tracy Station could change over the years due to the combination of units being utilized, especially for peaking purposes.

### Parks and Recreation

**Construction Impacts.** There would be no construction-related adverse impact on parks and recreation in the affected area because the construction workforce would be temporary, the project would not be located near any major parks or recreational areas, and the project would not remove any existing recreation facilities.

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Power Project. Therefore, there would be no adverse impact associated with usage of consumptive water rights associated with construction of the proposed Piñon Pine Power Project.

**Operation Impacts.** The small increase in population that would potentially occur during the operations phase of the proposed project would have a negligible impact on water and sewer services in the affected area. The TMWRF's unused capacity of 13 mgd (32.5 percent) would accommodate the additional sewer service needs generated by anticipated population increases (of less than 1 percent).

During its operations phase, the proposed project would have no impact on sewer services because it uses a septic system for waste disposal. Additional restrooms would be built for the proposed project; however, there would be no impact to sewage disposal because the existing leach field would have adequate capacity. Well water would be the source of water for the plant's raw water system. In addition to operational requirements, this system would provide water to the plant utility water system for miscellaneous uses, such as service wash stations. Potable water for safety showers and eyewashes would be provided by the existing system. The system is served by the raw water system that uses well water as its source. Drinking water would be provided as a brought-in bottled source or from well water, provided water quality in the new well is adequate. Fire protection water would be provided by the existing cooling system.

The energy requirements of the proposed project during its operations phase would have a negligible impact on available electricity. Additionally, the proposed project would have a direct, positive, long-term impact on the power supply in the region by partially supplying SPPCo.'s projected local energy requirements up to the year 2011. The impact would be significant because the energy provided by the proposed project would fulfill 104 MW gross of the 20-year projected energy demand (725 MW). In addition, because combined-cycle technology is a relatively efficient source of electricity generation, SPPCo. projects that no adverse short- or long-term impacts to electricity prices would occur. Estimations of electric rates and methods of calculating were submitted by SPPCo. as part of its Electric Resource Plan (*SPPCo., 1993c*).

A 20-year water usage projection for the Tracy Power Station and the proposed project show peak water usage at approximately 3,000 acre-feet (4.2 cfs) (see Table 4.1.8-4). This quantity is within the Tracy Power Station's allotted consumptive water rights of 4,100 acre-feet (5.7 cfs).

Health Care

**Construction Impacts.** Under worst-case conditions, the 26-month construction phase of the proposed project would result in a temporary increase of 885 people (350 families with the average Nevada family size equaling 2.53 persons) in the affected area. This temporary increase in population would not be adverse, and would be of short-term duration. No adverse impact on the ratio of health care providers to the general population in the affected area would occur.

**Operation Impacts.** The potential permanent increase of the affected area's population by 63 persons (25 families with the average Nevada family size of 2.53 persons) for the operations phase of the proposed project would have a negligible impact on available health care services.

Utilities

**Construction Impacts.** The small increase in population that would occur during the construction phase of the proposed project would have a negligible impact on water and sewer services in the affected area. The Truckee Meadows Water Reclamation Facility (TMWRF) has an unused capacity of 13 mgd (or 32.5 percent of total capacity) that would accommodate any potential additional sewer service needs generated by population increases (of less than 1 percent).

The proposed project, during its construction phase, would have no impact on sewer services because it would use a septic system for waste disposal. Additional portable facilities would be provided as needed. Construction activities should have minimal impact on public water system usage. Drinking water would be provided as a brought-in bottled source or from well water, provided water quality in the new well is adequate (see section 3.4.3). Fire protection water would be provided by the existing cooling system; the existing cooling pond is the current source for fire protection water, if needed.

The energy requirements of the proposed project during its short-term construction phase would have a negligible impact on available electricity.

The peak water consumption rate during the construction phase would be approximately 2,622 acre-feet (3.7 cfs) (see Table 4.1.4-1). This is approximately 1,060 acre-feet per year (1.5 cfs) more than in 1993 but it is identical to the projection for the Tracy Power Station without the proposed Piñon Pine

**Fire Protection**

**Construction Impacts.** Fire protection at the project site is under the jurisdiction of the Nevada Division of Forestry (NDF). According to the NDF, there would be no change in the current level of fire protection personnel or equipment during the construction phase of the proposed project. Fire protection and suppression systems at the Tracy Power Station provide 4,000 gpm of water to the fire protection water loop through the existing plant system with the existing cooling pond serving as the source of fire protection water. Because these systems are currently in place at the Tracy Power Station, construction activities would not adversely impact the quality of fire protection services.

**Operation Impacts.** According to the NDF, which would provide fire protection services for the proposed project site, there would be no change in the current level of fire protection personnel or equipment during the operations phase of the proposed project. The fire protection and suppression equipment currently in place at the Tracy Power Station, along with additional systems required to meet building codes, would assist to alleviate any minor need to the current level of fire protection services.

**Schools**

**Construction Impacts.** It is unlikely that the increased student-teacher ratio occurring from increased population size would create an adverse impact to schools. Under the worst-case assumption that all 350 temporary construction workers and their families would relocate to the affected area, the student-teacher ratio (based on 1992-1993 school year) would increase from 18.1 to 18.2. This calculation was made assuming an average Nevada family size of 2.53 persons with the average number of school-aged children per family equaling 0.85 (based on 1980 census data). The increased student-teacher ratio would cause a short-term, direct, but not significantly adverse impact to schools.

**Operation Impacts.** For the long-term operations phase of the project (anticipated to exceed 24 years), if a non-local workforce is assumed, there would be a permanent increase of approximately 21 students (using the same assumptions as for the construction phase calculations). This long-term increase would have a negligible impact on the student-teacher ratio for the affected area.

**Operation Impacts.** During the operations phase of the proposed project, approximately \$2 million in annual property tax revenues would accrue from the increase in property value. Of this amount, over \$700,000 in annual property tax revenues would accrue to Storey, Lyon, and Washoe Counties with the remaining \$1.3 million accruing to other areas in the state. The proposed project would provide long-term, direct, positive impacts to the affected area and the state by increasing property taxes.

#### **4.1.8.3 Public Services**

##### Housing

**Construction Impacts.** An adequate number of rental and sale units would be available to accommodate all 350 temporary construction workers and their families in the event that they all moved to the area during the 26-month construction phase, the impact of the proposed project to available housing during its construction phase would be short-term, direct, and not adverse. A short-term, direct, beneficial impact would be realized as a result of the reduced housing vacancy rate.

**Operation Impacts.** Because the size of the operations workforce would consist of only 25 workers, any impact to the housing vacancy rate would be negligible.

##### Police Protection

**Construction Impacts.** According to the Storey County Sheriff's Department, which has jurisdiction over the Tracy Power Station, the additional personnel required at the plant during construction would not adversely impact existing police services in the county. A worst-case influx of 350 construction workers and their families would not adversely impact population in the region.

**Operation Impacts.** The 25 permanent workers for the proposed project are expected to be partially fulfilled by the local workforce; however, in the event that the permanent workers and their families relocated to the area, the long-term direct impact to the level of police protection would be negligible.

Table 4.1.8-3. Expected number of operations workers.

Position	Additions to Staff	Labor Type
Yard operator for both coal and LASH	4 (1 per shift)	Operations
Assistant control room operators	4 (1 per shift)	Operations
Control room operator	4 (1 per shift)	Operations
Emergency relief operator	1	Operations
Laboratory technician	1	Operations
Electrical technician	2	Maintenance
Instrument technician, working foreman	1	Maintenance
Instrument technician, air quality	1	Maintenance
Instrument technician	1	Maintenance
Plant mechanic	2	Maintenance
Mechanic welder	1	Maintenance
Maintenance helper	1	Maintenance
Administrative assistant	1	Administration
Plant environmental specialist	1	Operations
Total additions to existing staff	25	

Source: SPPCo., 1993d.

using the IMPLAN model equaled 1.37 for the operations phase. The proposed project would be expected to yield a total income impact of approximately \$1.165 million annually during the operations phase. Therefore, employment income of workers during the operations phase of this project would have long-term, direct, beneficial impacts on income in the affected three-county area.

#### Tax Revenue

**Construction Impacts.** Total sales tax revenue, which would accrue during the construction phase of the project (1994-1996) would be approximately \$9 million, based on a sales tax rate of 6.75 percent. Of this amount, approximately \$6.3 million, or 4.75 percent of sales, would remain in Storey County while approximately \$2.7 million, or 2.0 percent of sales, would go to the State of Nevada. The proposed project would provide significant short-term, direct, positive impacts to the affected area and the state due to an increased influx of revenues from sales/use taxes over a short period of time.

Table 4.1.8-2. Expected number of construction workers by trade per quarter.

Trade	Quarter							
	12/94	3/95	6/95	9/95	12/95	3/96	6/96	9/96
Painter	0	0	0	0	0	0	20	15
Laborer	75	30	20	20	15	15	15	10
Equipment operator	15	20	25	25	15	10	10	5
Ironworker	10	60	100	20	10	10	0	0
Boilermaker	0	20	30	80	80	60	0	0
Electrician	10	10	10	15	50	60	60	20
Asbestos worker	0	0	0	0	0	15	40	40
Millwright	0	0	10	40	50	30	0	0
Cement mason	5	15	0	0	0	0	0	0
Sheet metal worker	0	0	0	0	0	10	50	50
Teamster	0	5	5	5	5	5	0	0
Carpenter	15	60	20	15	15	15	10	10
Pipefitter	0	10	10	90	110	120	130	80
TOTALS	130	230	230	310	350	350	335	230

Source: Foster Wheeler USA Corporation, 1993a.

term, direct, positive impacts on income in the affected area. The impacts would be dispersed, however, because the entire construction workforce would not necessarily reside within the affected area, and as a result, the \$59 million in income would be spent and circulated over a large geographic area.

**Operation Impacts.** Based upon an average hourly labor rate for public utilities workers of \$16.14 (*State of Nevada, 1992a*), the annual wages for a total of 25 permanent workers during the operation phase of the project would be approximately \$850,000. The economic multiplier developed

Table 4.1.8-1. Number of unemployed union members, May 1993.

Labor Union	Number of Members Currently Unemployed
Labor Local 169 (construction and industrial workers) – Reno	500
Ironworkers Local 118 – Reno	60
Carpenters Local 971 – Reno	100
Electrical Workers Local 401 – Reno	75
Plumbers and Fitters Local 350 – Sparks	160
Plaster and Cement Local 241 – Reno	5
Sheet Metal Workers Local 26 – Reno	10
<i>Source: Local labor unions in the affected area, 1993.</i>	

Income

Income multipliers developed in an economic study prepared for SPPCo. (*Cargill and Wendel, 1992*) were used to calculate total income impacts. The study developed a methodology to evaluate the potential economic impacts resulting from the construction of various power plants in selected Nevada counties, including an 89 MW IGCC plant constructed in Storey County. Its similarity to the proposed Piñon Pine Power Project allowed it to be used for estimating potential impacts of the proposed project on income in the affected area. Multipliers were developed in this study using the U.S. Department of Agriculture's Forest Service Impact Analysis for Planning (IMPLAN) model. These multipliers then were used to estimate the impact that spending would have on the local economy as money is spent and re-spent. For comparison, total personal income in Lyon, Storey, and Washoe Counties in 1989 was approximately \$5.5 billion.

**Construction Impacts.** An average labor rate of \$36.00 per hour (inclusive of fringe benefits) was estimated for construction phase compensation, based on the anticipated craft mix. The estimated total construction period of 1,147,900 person-hours at the average labor rate would yield a construction phase payroll of approximately \$41.3 million dollars. The economic multiplier developed using the IMPLAN model equaled 1.43 for the project construction phase. The proposed project would be expected to yield a total income impact of approximately \$59 million during the construction phase. Therefore, employment income of workers during the construction phase of this project would have short-

A more complete description of the surrounding area is provided in the Affected Environment section on socioeconomics.

**Construction Impacts.** The currently available construction labor resources in the affected area would be sufficient to satisfy the projected labor needs for construction of the proposed project, therefore, no increase or impact to population size is anticipated in the affected area. It is expected that local labor resources would be utilized to the extent possible; however, if all 350 construction workers and their families relocated to the affected area during the construction phase of the proposed project, the estimated maximum population increase would be 885 individuals (i.e., 350 families with an average Nevada family size of 2.53 individuals). The increase of 885 individuals would have a direct, short-term, positive impact on population size in the affected area. The impact would not be significant because it represents an increase of less than 1 percent.

**Operation Impacts.** The size of the operations workforce is anticipated to consist of 25 individuals. In the event that all of these individuals and their families relocated to the affected area, the estimated maximum increase in population would be 63 individuals (i.e., 25 families with an average Nevada family size of 2.53 individuals). The long-term impact to the population size of the affected area would be negligible.

#### **4.1.8.2 Local and Regional Economic Activity**

##### Employment

**Construction Impacts.** The currently available construction labor resources in the affected area would be sufficient to satisfy the projected labor needs for construction of the proposed project (see Table 4.1.8-1 and Table 4.1.8-2). It is anticipated that local labor resources would be utilized to the extent possible; therefore, employment of workers during the construction phase of the proposed project would have a direct, short-term, positive impact on the unemployment rate for the area. The impact would not be significant.

**Operation Impacts.** Because the operations workforce size is expected to be only 25 individuals (see Table 4.1.8-3), the impact to the local unemployment rate would be beneficial but of a negligible magnitude regardless of whether the operations labor force was drawn from local or nonlocal resources.

### 4.1.8 Socioeconomic Resources

The proposed project is expected to provide 25 full-time jobs (operations phase) and 350 temporary jobs (construction phase). The currently available labor resources in the immediate area would be adequate to support the demand for labor, although it is anticipated that some of the labor resources would be obtained from outside the immediate area. This would result in short- and long-term, direct, positive impacts to the unemployment rate in the affected area. Short- and long-term, direct, positive impacts would also occur to the current housing vacancy rate in the affected area as a result of incoming laborers. Short- and long-term revenue benefits from both property taxes and sales taxes (on building materials and fuel supplies) would also be realized. A short-term impact would include increased sales/use tax revenues during the construction period. Schools, police protection, fire protection, and medical services are anticipated to be sufficient to accommodate population increases from the proposed project during both construction and operation and would experience negligible impacts. SPPCo.'s existing water rights are sufficient to handle the projected increased water usage required by the proposed project. The reduced river flow that would result from water usage of the proposed Piñon Pine Power project would most directly affect the Newlands Project because the diversion to the Truckee Canal (for the Newlands Project) lies between the Tracy Power Station and Derby Dam on the Truckee River. Once senior water rights between Derby Dam and Pyramid Lake are met, *unappropriated* flows can be diverted to the Truckee Canal. However, because SPPCo.'s existing water rights are senior to the Newlands Project, additional water use by SPPCo. would reduce water available to the Newlands Project. In general, downstream water users would have the potential to lose access to less than 0.5 percent of the Truckee River's flow. No adverse socioeconomic impacts are anticipated to be associated with the proposed project during either the construction or operations phase.

#### 4.1.8.1 Demographics

This section describes the potential impacts on population from construction and operation of the proposed project. There are approximately 12,439,200 acres of land in the immediate three-county area (Washoe, Storey, and Lyon Counties) in proximity to the proposed project. The total combined population (based on 1990-91 census figures) was 277,194. This translates to an average of 15.7 acres/person. Considering each county separately, population density is 64.7 acres/person in Lyon County, 8.4 acres/person in Washoe County, and 356 acres/person in Storey County. The nearest resident to the plant site is approximately one mile away.

#### **4.1.7.2 Native American Cultural Resources**

**Construction Impacts.** No Native American cultural resources would be impacted as a result of the proposed construction activities at the Tracy Power Station.

**Operation Impacts.** There are presently no Indian sacred sites of religious worship on the project property or within the affected property area. Consultation with Native American Tribes have not indicated any religious practices associated with the proposed action or site. No infringement of the American Indian Religious Freedom Act of 1978 would occur as a result of project operation. No impacts on Native American cultural resources would occur as a result of the application of the proposed action.

As discussed in section 3.7.2, the Pyramid Lake Paiute Indian Tribe historically relied heavily upon the Cui-ui for food (the name for these people in their native tongue translates as "Cui-ui eaters"). Much of their culture does in fact center around the Cui-ui, and the Tribe maintains the only Cui-ui hatchery in the world. Because this fish is part of their cultural heritage, the Tribe was able to claim (and win) the water rights necessary to maintain Pyramid Lake. The Cui-ui Recovery Plan identifies four ongoing conservation measures for this endangered species. One of the four, Management Actions, indicates there should be continued maintenance and operation of the David Koch Cui-ui Hatchery by the Pyramid Lake Tribe. The Tribe's active involvement in the recovery of the Cui-ui would not be diminished or adversely affected by the construction and operation of the proposed project. For additional information on Cui-ui recovery, see section 3.6.3.

#### **4.1.7.3 Historic Resources**

**Construction Impacts.** No standing structures or historic sites on, or eligible for, the National Register are present on the Tracy Station site. Therefore, construction activities would not adversely impact any historic resources.

**Operation Impacts.** Operation of the proposed project would not adversely impact any historic resources on, or adjacent to, the Tracy Power Station site.

Evaluation is available in the reading rooms (see Appendix H); the opinions of the SHPO and the Advisory Council on Historic Preservation are provided in Appendix B.

#### **4.1.7.1 Archaeological Resources**

An archaeological survey of the proposed Piñon Pine Power Project site and adjacent areas resulted in the discovery of eight prehistoric sites and two isolates. The eight sites are located, generally, on the south side of the cooling pond, and the western portions of the study area, away from the Tracy Power Station and plant activities. The present configuration of the project could affect two of the sites, **26-St-193** and **26-St-82**. Site **26-St-82** has mostly been destroyed by sand and gravel quarrying operations and retains no scientific value. **26-St-193** was tested and found ineligible for National Register nomination.

**Construction Impacts.** No adverse impacts from construction would be expected to occur. To ensure protection of site **26-St-191**, a 6-foot chain-link fence would be constructed around the site. A 6-foot chain-link fence also would be constructed on the north side of the rail line between the rail and sites **26-St-194**, **-195**, **-196**, and **-197**.

Because archaeological deposits are sometimes completely buried and lacking in surface indications, it is possible that construction activities could encounter buried deposits. If this occurs, construction would halt in the immediate vicinity of the find until a professional archaeologist, in consultation with the SHPO, could evaluate the resource.

**Operation Impacts.** The proposed railroad spur design configuration would avoid sites **26-St-194**, **-195**, **-196**, and **-197**. Because they are located at the cooling pond, the railroad spur would not affect **26-St-191** or **26-St-192**. If the final project design involves installation of new facilities at the cooling pond, the need for subsurface testing would be determined in consultation with the SHPO. The chain-link fence protecting site **26-St-191** would remain in place during operation. No adverse impacts would be expected from the proposed action on archaeological resources. The SHPO has deferred *determination of the* eligibility of sites **26-St-194**, **-195**, **-196**, and **-197** until further evaluation has been made; however, the SHPO has agreed that the fence would act as a permanent protection measure and would adequately protect properties (see Appendix B).

#### 4.1.6.4 Biodiversity

Conservation of biological diversity has been recognized as a major national and global goal. In January 1993, the CEQ published a report entitled Incorporating Biodiversity Considerations Into Environmental Impact Analysis Under the National Environmental Policy Act. Although this report is not formal guidance on the subject of biodiversity, options for the analyses of biodiversity in NEPA documents are presented. The loss of biological diversity has ecological, economic, and aesthetic consequences concerning the variety of life found in natural systems. Main factors that contribute to declining biodiversity include physical alteration of natural areas, pollution, overharvesting of species, introduction of exotic species, disruption of natural processes, and global climate change. Three of these factors are particularly important with respect to the present project: physical alteration of natural areas, pollution, and disruption of natural processes.

As discussed in the previous sections, little impact to terrestrial and aquatic habitats and wildlife in the area would be expected from either construction or operation of the proposed project. Although 3 percent of the undisturbed habitat would be lost, there would be no loss of biodiversity because the habitat types affected (i.e., natural and disturbed big sage desert shrub communities) are common to the area. In addition, activities could result in more invader species but since this has been the pattern in the region since the days of early settlers, it would not impact biodiversity. Field surveys have not identified any diversity in species, communities, or ecosystems that is unique to the project site or the immediate area around the existing Tracy Station. The overall impact to biodiversity would be negligible as a result of implementation of the proposed action.

#### 4.1.7 Cultural Resources

Archival and archaeological investigations of the proposed project site were conducted in the Spring and Summer of 1993. No National Register sites or structures are present at Tracy Station. Two archaeological sites potentially impacted by construction were tested for National Register eligibility. Neither of these sites appear to meet the criteria for eligibility. The State Historic Preservation Officer (SHPO) reviewed the Historic Properties Inventory and Archaeological Site Evaluation (*Ebasco, 1994*) and concurred (see Appendix B) that neither site was eligible for nomination to the National Register of Historic Places under any of the Secretary's criteria. The Advisory Council on Historic Preservation also has reviewed the documentation and under the procedures set forth in 36 CFR 800.5(d)(2), does not object to the findings of no adverse impact. The Historic Properties Inventory and Archaeological Site

## Piñon Pine Power Project

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is 35,715 acre-feet (50 cfs) (period of record 1919 to 1991, gauge number 10351600 near Wadsworth). The average additional withdrawal of Truckee River water at the proposed project site would be approximately 84 acre-feet per month (1.4 cfs), or approximately 0.23 percent of Pyramid Lake monthly inflow during the April to July time period, which has been identified as the spawning period for the Cui-ui (USFWS, 1992), and 0.18 percent of inflow during the attraction flow period in April and May. Under low flow conditions, this withdrawal would impact the Newlands Project because of its lower priority right, and not Pyramid Lake (see section 4.1.4.1). This volume of additional diversion would have no significant effect on Cui-ui in the lower Truckee River. Cui-ui have migrated from the Truckee River back to Pyramid Lake prior to the lowest flow period of August to October.

Lahontan cutthroat trout migrating out of Pyramid Lake are currently captured at Marble Bluff Dam and spawned in the hatchery. Because of the insignificant hydrological impact of the project on Truckee River inflow to Pyramid Lake, the project would not affect Lahontan cutthroat trout migration or survival.

The proposed project would not discharge any water directly into the Truckee River. As a result, any potential impacts to Cui-ui or Lahontan cutthroat trout from water quality or sediment load changes would be avoided.

Bald eagle wintering habitat would not be affected by the operation of the proposed Piñon Pine Power Project because of the distance between Truckee River riparian habitat and planned project facilities. As stated previously, bald eagles wintering in the project area appear to be accustomed to the noise in the area; and therefore, increased noise disturbance from project operation would not result in significant impacts.

The Biological Assessment for the Cui-ui, Lahontan Cutthroat Trout, and Bald Eagle has been completed, reviewed by the USFWS, and is available in the reading rooms (see Appendix H). The USFWS concurred with the Biological Assessment's "no effect" determination of the bald eagle, Cui-ui, and Lahontan cutthroat trout because the Service had already incorporated exercising Orr Ditch Decree water rights in each species' environmental adverse effects baseline (see Appendix B for the USFWS opinion).

The Cui-ui and Lahontan cutthroat trout would not be affected because these species are not present in the immediate area. The Cui-ui cannot migrate above Derby Dam, which is located 8.9 km (5.5 miles) downstream of the proposed site. The Truckee River habitat (e.g., discharge, water temperature, and water quality) would not change as a result of the construction of the proposed Piñon Pine Power Project. Any additional water needed during construction would not impact sensitive fish species because the volume of water would be minimal.

Bald eagle wintering habitat requirements, such as perching and roosting trees and foraging areas, would not be affected by the construction of the Piñon Pine Power Project because most of the project's proposed facilities are located more than 305 meters (1,000 feet) from the Truckee River riparian habitat. Construction of the proposed Piñon Pine Power Project would not result in the loss of perching and roosting trees along the Truckee River. Increased noise disturbance to wintering bald eagles during construction would not be significant. Bald eagles wintering in the project area have appeared to become accustomed to the noise from the Tracy Power Station, traffic along I-80, the Southern Pacific Railroad, and surrounding mining operations. Construction of the Piñon Pine Power Project would not result in a significant increase in noise (see section 4.1.11).

**Operation Impacts.** Operation of the proposed Piñon Pine Power Project would not result in significant impacts to sensitive wildlife and fish that may occur within the survey area or to the habitats of these species.

The endangered Cui-ui sucker and threatened Lahontan cutthroat trout are the two fish species potentially affected by changes in water diversion at the project site. Although neither species is present in the vicinity of the project, greater usage of existing water rights could decrease flow in downstream areas for spawning and rearing of Cui-ui, or for spring attraction flows for Lahontan cutthroat trout migrating out of Pyramid Lake. The Cui-ui Recovery Plan (*USFWS, 1992*) and Truckee River Operating Agreement are two programs that are currently addressing operational mechanisms, water rights acquisition, and other methods to provide sufficient water for fisheries resources in the Truckee River basin. As stated previously, the Cui-ui Recovery Plan assumes full use of SPPCo.'s existing water rights. The proposed project would have no impact on the implementation of the Cui-ui Recovery Plan.

Average annual inflow to Pyramid Lake for the years 1918 to 1970 was approximately 250,000 acre-feet per year (350 cfs), peaking in May with a monthly average of 56,000 acre-feet (*USFWS, 1992*). The average inflow during the months of Cui-ui spawning and rearing (April to July)

types that would be impacted (i.e., natural and disturbed big sage desert shrub communities) are common habitat types in the survey area. Important, potentially limiting, and relatively rare habitat types such as riparian woodland would not be affected by the project.

It should be noted that this estimated loss of 3 percent of undisturbed habitat is based on the assumption that the wildlife habitat values would be permanently lost. However, some natural revegetation likely would occur in areas such as the tailings from the new evaporation pond, and areas along the new railroad tracks impacted by construction. Species composition in these regenerated communities and the length of time it would take for these communities to become established would depend on factors such as level of disturbance, soil compaction, and the presence or absence of topsoil.

Noise disturbance to wildlife from operation of the proposed Piñon Pine Power Project would not be significant. Wildlife species using the survey area appear to be accustomed to the noise from the Tracy Power Station, traffic along I-80, the Southern Pacific Railroad, and surrounding mining operations. Operation of the proposed Piñon Pine Power Project would not result in a significant increase in noise (see section 4.1.11). No significant impact to the birds in the area would be anticipated. A slight increase in collision potential may occur with objects that provide hazards during foggy conditions. This has not been a major concern with current structures and should not increase significantly.

The proposed evaporation pond would have water quality characteristics similar to or better than the existing evaporation pond, but would not likely support aquatic life. Terrestrial wildlife that may drink water from the evaporation pond would be exposed to high concentrations of salts and potentially high concentrations of dissolved metals. Wildlife exclosures constructed around the proposed evaporation pond would minimize the chance of wildlife and birds being exposed to negative effects from the evaporation pond. The specifications of these exclosures, if needed, would be determined in consultation with the Nevada Division of Wildlife (NDOW) (see section 4.1.6.1).

### **4.1.6.3 Threatened and Endangered Species**

**Construction Impacts.** Construction of the proposed Piñon Pine Power Project would not result in significant impacts to sensitive wildlife and fish that may occur within the survey area or to the habitats of these species. Insignificant impacts to sensitive terrestrial wildlife may include minor disturbance from noise during construction activities.

Modification would include loss of vegetative cover, loss of topsoil, erosion, soil compaction, and impacts to vegetation resulting from the potential release of materials such as oil and diesel fuel from construction equipment. Soil compaction caused by heavy equipment and loss of topsoil would further reduce conditions for native vegetation, thereby increasing the potential for invasion of more weedy, nonnative species. Materials spills such as oil or diesel could contaminate vegetated areas. However, the potential for such a spill is unlikely because of the implementation of the spill control plan, and impacts would be localized.

The primary impact to terrestrial resources would be the conversion of approximately 20 acres of big sagebrush desert shrub habitat to project facilities. Because of the already disturbed condition of much of the project area; the relatively small areal extent of impacts; and the avoidance of impacts in important habitat types such as wetlands, riparian forest, and the Truckee River; the impacts to terrestrial resources resulting from loss of habitat would be minor. These minor impacts would be further reduced by limiting ground disturbance to a minimum. Additionally, topsoil would be removed from construction areas, stored, and placed on top of spoil areas to facilitate revegetation.

**Operation Impacts.** Impacts to vegetation resulting from exposure to increased concentrations of SO<sub>2</sub> and NO<sub>x</sub> in the air would not be significant. Ambient levels of these compounds resulting from operation of the proposed Piñon Pine Power Project are below threshold values determined to cause foliar damage in plants that are physiologically sensitive to these compounds (see section 4.1.2.1).

The Piñon Pine Power Project would affect wildlife that occur within the proposed operation area. Impacts to wildlife would include loss or modification of habitat and noise disturbance. The long-term or permanent loss of big sagebrush desert shrub and revegetated desert shrub communities would result in a permanent decrease in the populations of wildlife that currently use these areas. However, these impacts would be minor because the impacts would be limited to a relatively small area located within a much larger, partially disturbed setting.

A total of 340 acres, or approximately 62 percent of the survey area, is already disturbed. Disturbed habitats include created ponds, areas that have lost vegetation and topsoil, and areas where tailings from pond construction or mining activities have been placed. The project would impact approximately 28 additional acres, including 15.6 acres of undisturbed big sage desert shrub and 4.6 acres of revegetated big sage desert shrub. This relatively small areal extent of project impacts would represent the conversion of an additional 3 percent of undisturbed habitat to project facilities. Further, the habitat

plants such as rose and currant in an appropriate area to act as an attractant. Such planting would be performed by SPPCo.

Construction of the proposed Piñon Pine Power Project also would temporarily disturb waterfowl and other bird species. Birds that currently nest near proposed project features such as the plant, cooling towers, railroad track, coal off-loading facility, and coal conveyor would be disturbed by construction activities. This disturbance could cause nest abandonment, reduced nesting success, or selection of alternative nest sites.

It is anticipated that the proposed project site would be disturbed either by grading (which would remove topsoil and vegetation) or through compaction (by traffic and equipment storage). This would permanently displace all wildlife and vegetation in these areas. A short-term impact caused by construction noise and activities would be anticipated in surrounding areas, which also would result in wildlife displacement. *During the cleanup phase, the activity known as "steam blowing" has the potential to create the most noticeable noise. The temporary (1-to-2-week period) and short duration (about 2½ minutes each) steam blowing activity would cause audible levels of noise. Instantaneous steam blowing levels would be, on average, 92 dBA, with maximum of 110 dBA. The maximum noise would be equivalent to an unmuffled motorcycle at 0.9 meters (3 feet) which is considered very loud. Studies have shown that when cattle and sheep were exposed to sonic booms for four days, the effects of noises were not unusual and that the animals returned quickly to grazing or other normal activities when interrupted (Espmark et al., 1974). In addition, Busnel and Briot (1980) observed that birds, such as gulls, pigeons, jays and various forms of wildlife were abundant in land areas adjacent to some airport runways. They concluded that animal populations grew independently of the amount of air traffic. Other observations showed that migratory birds do not hesitate to utilize airport environs as nesting places during migration even in the presence of noise levels up to 120 dB. Peregrine falcons were subjected to low-level jet aircraft and mid to high altitude sonic booms to assess detrimental effects of both young and adults. The noise pollution most often evoked only minor responses and never interfered with reproduction. Reoccupancy rates for sites experimentally disturbed were at or above normal for the following year. It was concluded that this noise had no extreme adverse effects on the study birds. No impact to livestock is expected from noise associated with the construction phase of the proposed project.*

Construction of the proposed Piñon Pine Power Project would affect vegetation communities in the survey area by eliminating, permanently modifying, or temporarily modifying vegetated areas.

would likely occur, these fluctuations are expected to remain within the current range. Thus, no adverse impacts to aquatic resources in the cooling pond would be expected to occur.

Wastewater in the evaporation ponds would not be anticipated to result in any adverse effect on wildlife such as migrating waterfowl. SPPCo. would periodically test the evaporation ponds and compare the results with section 445 of the Clean Water Act for wildlife propagation. If the water quality is found to be out of compliance with these standards, SPPCo. would either neutralize the pond's contents or work with NDOW to develop necessary exclusion measures.

*The emissions most likely to affect aquatic ecosystems would be SO<sub>2</sub> and NO<sub>x</sub>, which would contribute to acidic deposition (see section 4.1.2.3 for a discussion on acid rain). The most acid-sensitive species documented in the Truckee River in the vicinity of the proposed site are the shiner, dace, sculpin, and rainbow trout. These species experience impacts from acidification at pH of approximately 6. Because the river's current pH ranges from 7.14 to 8.65, and exhibits high acid neutralizing capacity, it is unlikely that the proposed project would result in a decrease in pH. Consequently, no impact to fish species is expected.*

#### 4.1.6.2 Terrestrial Ecosystems

**Construction Impacts.** The majority of vegetation to be removed during construction would be invader species (e.g., cheatgrass) and not native to the area. A ¼ acre stand of Indian ricegrass mixed with about 20 shrubs (*Artemisia tridentata*, *Grayia spinosa*, *Atriplex canescens*, *Atriplex confertifolia*) would be removed in order to make room for the coal storage area. Since a majority of the proposed project site is barren, impacts to vegetation would be minimal. In addition, trees such as cottonwoods, poplars, and alders are planned for placement along the south bank of the Truckee River.

There would be permanent displacement of some wildlife species that now utilize the site proposed for development. Rodents, including ground squirrels, mice, wood rats, and kangaroo rats residing in the area of native vegetation slated for coal storage, would be displaced as a result of construction activities. Larger mammals, such as raccoons, that utilize the area near the river may be only temporarily disturbed during construction and would move back when construction activity subsides. Mule deer that regularly utilize the power plant property to access the river would be displaced and would need to find a new river access location site. This action could be facilitated by planting food source

USFWS in February 1994. The USFWS concurred with the conclusion of the Biological Assessment that the proposed Piñon Pine Power Project would not adversely impact the Cui-ui or the efforts of the Cui-ui Recovery Plan. The USFWS response to the Biological Assessment is provided in Appendix B. The Biological Assessment is available in the reading rooms (see Appendix H).

Since the amount of additional diversion from the Truckee River would be extremely small relative to current river flows and other diversions, there would be no significant impacts on Truckee River aquatic habitat from the proposed project. Two perforated plate screens at the intake facility at the Tracy Power Station currently prevent entrainment of fish from the Truckee River. The existing screens can accommodate any additional diversion volume.

The cooling pond at the Tracy Power Station currently supports a number of warmwater fish species. The proposed project would result in changes to inflow and outflow from the cooling pond (*because of changes in the utilization of existing Tracy Station units*), but there would be no significant changes in water level. Evaporative water loss from the cooling pond would, however, tend to slightly increase total dissolved solids (TDS) over time. Although the TDS in the cooling pond may increase slightly because of evaporation, the ionic concentration of the cooling water is already considered high; so that minute TDS increases associated with evaporative water loss from the surface of the pond are not expected to significantly alter the existing cooling pond ionic concentration.

Anticipated temperature fluctuations in the pond would result from divergent ambient air temperatures and because the utilization of the cooling pond would be different if the proposed project were to be built. The three existing operating units use the cooling pond. The proposed Piñon Pine Power Project would not use the cooling pond. Currently, the existing units provide both base load (supplying the relatively constant power demands of the area) and peaking capacity (during times of high power demand). As a result, current cooling pond utilization is relatively constant and dynamic, so that temperature fluctuations are minimized. If the proposed project were to be constructed, when it went on line, it would be used to provide base load (and thus be running at nearly full capacity at all times), but would not discharge to the cooling pond. Other Tracy Station units would then only provide power as needed. As a result, the cooling pond would be used primarily when power demands required peaking units (that use the cooling ponds) to be used. Depending on the day to day operating scenario, cooling pond water consumption and discharges to the cooling pond could be expected to fluctuate somewhat more than they do with existing operating conditions. However, even though temperature fluctuations

site could potentially impact aquatic resources of the Truckee River if increased soil erosion leads to increased fine sediment loads in the river. Since the construction zones would be located away from the river or other drainages, increased fine sediment loads would be unlikely. Introduction of fine sediment to the Truckee River would be further precluded by implementing a soil erosion control plan at the site. Potential impacts of project construction on aquatic resources also would be avoided through implementation of the hazardous spill control plan. The plan contains provisions to contain any spills of gas or oil that might adversely affect water quality.

**Operation Impacts.** Development would occur far enough away from the Truckee River to avoid direct involvement (intrusion), and disturbed areas would be wet down sufficiently to prevent fugitive dust or siltation from occurring. No denuding of the riverine vegetation, especially trees providing shade cover of the water, would be expected. Shade cover aids in keeping water temperatures at a level conducive for the fish. The Cui-ui spawn in the Truckee River but cannot migrate above Derby Dam, which is located approximately 8.9 km (5.5 miles) downstream of the proposed project site. As a result, the fish remain far enough away to avoid direct contact with the project site. Best management practices would be incorporated into the containment of hazardous materials and coal to prevent them from entering the river and potentially harming the fish or other wildlife. *In addition, no impact to the Truckee River is expected from rail transportation of coal. Should an accident occur, Southern Pacific Railroad's contractor would be able to clean up any spill before an adverse impact could occur.*

Operation of the new generating unit at the Tracy Power Station site would result in slightly greater diversion of water from the Truckee River. Existing water rights allow for diversion of 3,500 acre-feet per year (4.9 cfs); the current consumptive use of approximately 1,000 to 1,800 acre-feet (1.4 to 2.5 cfs) per year would increase by approximately 1,004 acre-feet per year (1.4 cfs) (SPPCo., 1993d). Water to meet the increased demand would come from a combination of river and groundwater sources, with diversions occurring at a relatively constant rate throughout the year. Diversion of the full 1,004 acre-feet (1.4 cfs) from the Truckee River would represent an average diversion of less than 3 percent of monthly flows compared to a mean annual Truckee River discharge of 790 cfs at the Tracy gauge just downstream of the project. Summer low flows at the Tracy Station gauge are approximately 400 cfs, although they may drop below 100 cfs during prolonged droughts. This additional water diversion is within SPPCo.'s existing water rights; full use of water rights at the Tracy Power Station have been assumed as part of the hydrological foundation of the Cui-ui Recovery Plan. Informal consultations between DOE and the USFWS regarding potentially affected threatened and endangered species have been ongoing over the past year. A Biological Assessment was formally submitted to the

Propane would be delivered by truck; since this is not the primary or secondary fuel, it is anticipated that one delivery of no more than 20 truckloads per year would be needed after initial fueling. Limestone would be delivered by truck; it is anticipated that two or three trucks per day would be required. Consumables such as solvents, lubricating oil, and parts would add an additional truck trip per week. Combustion waste would consist of a mixture of spent limestone and ash (LASH). During initial operation of the IGCC installation, the LASH may be disposed at a state-approved landfill. Long-range goals are to use the material for gypsum, structural fill, or as a soil amendment. The LASH would be transported for disposal or reuse by either truck or by rail. If it is more effective to transport the LASH by truck, then it would be shipped during the day shift, seven trucks per day, seven days per week. If transported by rail, then the LASH would be shipped in 10 railcars per week. As stated previously, LASH is expected to amount to a maximum of 134 tons per day, requiring no more than 50 truckloads per week with an average truckload of 20 tons. It is estimated that limestone would be trucked in at a rate of 40 tons (or up to 2 to 3 truckloads) per day. Consequently, the transportation of LASH and limestone in this manner would fall within the maximum load rating capacity of the bridge.

#### **4.1.6 Biological Resources and Biodiversity**

No significant adverse impacts to aquatic and terrestrial biological resources currently utilizing SPPCo. land or waters would be expected. Essentially from the period of the first human settlement, the vegetation in this area has been disturbed, resulting in the site's current barren state. Impoundments have been established that have provided potential increased habitat for waterfowl, and planned plantings of native vegetation (where appropriate), planting trees to provide shade from direct sun on the river (to inhibit warming the river water), and plantings of appropriate food sources for terrestrial wildlife are expected to improve existing conditions. Barrier fencing would be placed around areas of potential concern (such as the evaporation pond, and construction/operations areas), if deemed necessary by the Division of Wildlife, to prevent potential injury to wildlife. An informal consultation with the U.S. Fish and Wildlife Service has resulted in a determination that there would be no effect to any threatened or endangered species identified in this area (see Appendix B).

##### **4.1.6.1 Aquatic Ecosystems**

**Construction Impacts.** No long-term impacts to aquatic ecosystems would be anticipated from construction. Short-term impacts may include dust contamination from the windblown, dry, and unstabilized area; truck traffic; and other activities. Construction activities at the Tracy Power Station

Table 4.1.5-1. Tracy Power Station bridge load ratings.

Vehicle Type	Maximum GVW	Maximum Axle Load
Type A	104,000 lbs (52 tons)	48,000 lbs/group
Type B	80,000 lbs (40 tons)	34,000 lbs/group
Type C	40,000 lbs (20 tons)	32,000 lbs
Type A =	Tractor/semi-trailer and second trailer configuration with approximately 20 feet between axle groups ("18 wheeler type," five axles plus second trailer).	
Type B =	AASHTO type HS, (tractor/semi-trailer, 10 wheels, three axles).	
Type C =	AASHTO type H, (single chassis truck, 6 wheels, two single axles)	

along this route daily. Because a new railroad spur would be constructed as part of this proposed project, minimal impact to the right-of-way accorded existing train traffic is expected.

Coal would be delivered by rail in railcars of approximately 100-110 ton capacity. Coal would be shipped to the project site primarily from Utah, Montana, Wyoming, and Colorado along a coal-delivery route used by various entities. Use of western coal has the added benefit of shorter travel distances (eastern coal would be used for a short-term demonstration and would require a cross-country trip from Pennsylvania). It is estimated that a 4-locomotive, 84-car train would deliver coal to the off-loading facility approximately once a week during the operation phase of the proposed project. This would result in a small increase in the rail traffic along the main route. All train cars would be pulled off the main track during the coal off-loading process. The existing rail spur would be extended or modified to accommodate *the* train to enable the off-loading process to proceed without affecting traffic on the main rail line. Therefore, no adverse impact on rail transportation would result from the proposed project. In addition, no adverse impact to the Truckee River is expected from coal transportation. Between 1988 and 1993 (the period for which records are available), four train incidents occurred in the affected area. All of them were in the Reno/Sparks metropolitan area and were more than 2.4 km (1.5 miles) from the nearest point of the Truckee River. *If a spill were to occur during transport, Southern Pacific Railroad would be responsible for cleanup. The railroad company has a contingency plan on file; Washoe County Health Department, Nevada Health Department, Nevada Division of Environmental Protection, Pyramid Lake Paiute Indian Tribe, Nevada Department of Wildlife, the U.S. Fish and Wildlife Service, and the Truckee-Carson Irrigation District would be notified.*

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and along the access road. This impact would be temporary (short-term) and the extent of the impact would affect mostly construction workers, who would represent approximately 59 percent of those using the exits.

There are three parking lots at the Tracy Power Station. Two lots have a combined total of 36 spaces. Normally, these existing parking lots are about two-thirds full, with approximately 12 spaces unfilled (*personal communication, Brent Higginbotham, Project Engineering Manager, SPPCo., Reno, NV, June 4, 1993*). An additional 2-acre parking area was added along the access road northeast of the bridge for the installation of new combustion turbines at the Tracy Station. The area was cleared and gravel was spread over the lot. These three lots would adequately accommodate the parking needs during construction.

Because the proposed stack on the proposed Piñon Pine Power Project may extend higher than 200 feet, a Notification of Construction in Navigable Airspace must be filed with the Federal Aviation Administration (FAA) to determine whether or not the structure is a hazard to air navigation. SPPCo. does not anticipate any difficulty in obtaining this permit, which would signify that a hazard would not exist.

**Operation Impacts.** It is expected that ADT levels would increase because of operation of the proposed project, primarily as a result of transportation related to operations personnel and fuel and consumables shipments. A total of 20 to 25 additional personnel could result in up to 25 vehicle trips per day to and from the plant site. This expected traffic would represent a negligible increase in the current ADT level, again, because only existing roads currently exposed to moderate use in a sparsely populated area would be utilized. The issue of fog production and its impact on traffic is discussed in section 4.1.2.2, Visibility.

The Tracy Bridge, which links the access road over the Truckee River to the proposed Piñon Pine Power Project site, currently has a load limit of 52 tons, according to a load rating reported in January 1991. The bridge would be maintained as necessary to safely accommodate the current maximum load rating of 52 tons but no increase in load bearing capacity is needed. Table 4.1.5-1 lists the recommended load ratings (maximum gross vehicle weight - gvw) for different types of vehicles.

Railroad access to the site is provided by the Southern Pacific Railroad Company. Tracks run through SPPCo. property to the south of the Tracy Power Station. Approximately 12 to 14 trains travel

**Operation Impacts.** Operation of the proposed plant to demonstrate air-blown, fluidized-bed, coal gasification technology would take place where three oil/gas-fired steam units and two gas turbines currently are operating. In addition, two 83.5 MW simple cycle combustion turbine generators *became* operational in June 1994. No impact to land use would result from the operation of the proposed Piñon Pine Power Project.

#### **4.1.5.2 Land Use Trends and Controls**

**Construction Impacts.** The proposed project would be in conformance with zoning for Storey County. A Special Use Permit would need to be obtained from the county for construction of the project. A Special Use Permit is required for all projects within an industrially zoned area. These types of permits are routine in nature; issued to allow the county government an additional opportunity to review all aspects of the project; and do not signify that problems are expected to occur as a result of a project.

**Operation Impacts.** The Special Use Permit discussed in the previous section also would apply to operation. Although the proposed project would be located next to the Truckee River, it would be operated as a zero discharge facility and therefore, no adverse effects to the river would be expected.

#### **4.1.5.3 Transportation and Infrastructure**

**Construction Impacts.** It is expected that average daily traffic (ADT) levels would increase as a result of the construction of the proposed project. During the 26-month construction period, it is estimated that three truckloads of materials and equipment would be required each day. In addition, up to 350 vehicle trips per day are expected to be required for construction personnel traveling to and from the site. Thus, traffic patterns in the vicinity of the Tracy Power Station would undergo a direct, short-term impact during construction that would not be significant because only existing roads currently exposed to moderate use in a sparsely populated area would be utilized.

As shown in Table 3.5-1, an average of 29,850 vehicles travel on I-80 daily. The increase in traffic during the construction phase would represent less than a 3 percent increase in I-80's current ADT count. A potential temporary impact at the Tracy-Clark Station exits would involve the daily commute of construction personnel during the 26-month construction period. Current ADT at these exits is 175 vehicles eastbound and 70 vehicles westbound. An additional 350 vehicle round trips per day (maximum impact expected during the 6-month peak construction period) may affect the traffic flow on these exits

**Operation Impacts.** Potential direct impacts to the floodplain would result from site grading and filling, and the permanent placement of switchyard equipment. These potential impacts would include flood water storage and impediments to flood flow conveyance. However, because of the limited size and open structure of the switchyard, these potential impacts are expected to be minimal. The site is devoid of vegetation, is not an ecologically sensitive area, and contains no wetlands. Therefore, potential indirect impacts to habitat, resulting from flood storage and impediments to flow conveyance, are expected to be minimal.

#### **4.1.4.5 Wetlands**

Pursuant to Executive Order 11990 - Protection of Wetlands (May 24, 1977) and 10 CFR Part 1022, (Compliance with Floodplains/Wetlands Environmental Review Requirements), the possible long- and short-term adverse impacts resulting from any wetlands destruction or from occupancy and modification of any wetlands were considered.

**Construction Impacts.** Construction of the Piñon Pine Power Project would not impact wetlands. Wetlands within the survey area are located primarily along the Truckee River, well-distanced from proposed project features. A temporary fence would be erected if necessary, adjacent to wetlands areas, to ensure that all construction activities occur outside the wetlands.

**Operation Impacts.** Operation of the proposed Piñon Pine Power Project would not impact wetlands because wetlands within the survey area are located a substantial distance from proposed project features.

#### **4.1.5 Land Use**

Impacts to existing land use from the proposed project would be negligible. The proposed project conforms with applicable Storey County zoning; however, a Special Use Permit would have to be approved by the county to begin construction of the project.

##### **4.1.5.1 Existing Land Use**

**Construction Impacts.** Site preparation and plant construction are expected to have a negligible impact on present land use. The proposed Piñon Pine Power Project would be constructed adjacent to the existing Tracy Power Station.

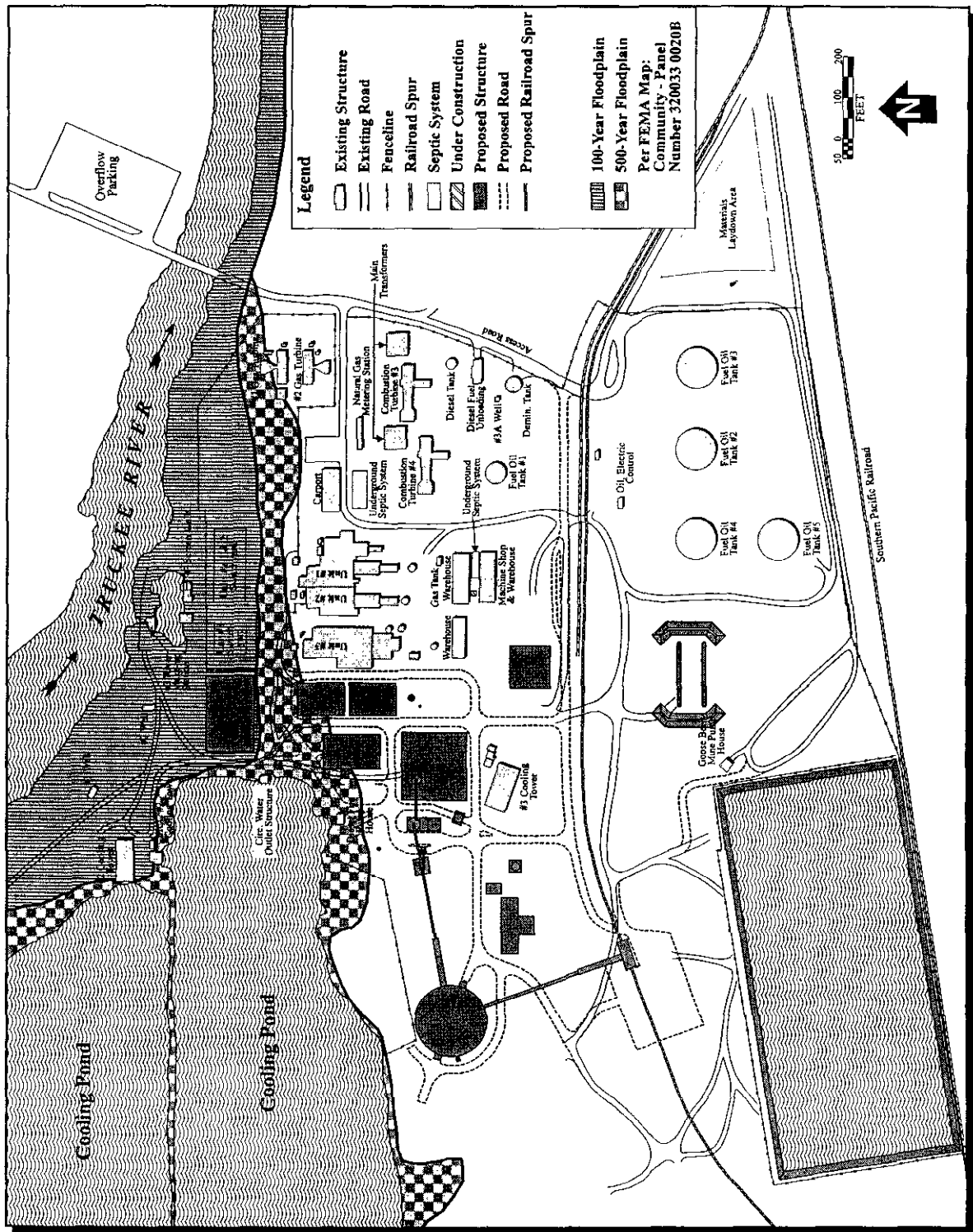


Figure 4.1.4-1. Features of the proposed Piñon Pine Power Project located within the 100-year floodplain.

Table 4.1.11-4. Noise modeling results.

Modeled Receptor Location	Noise Level (dBA)					
	Existing Tracy Station at Full Load	Two Additional Simple-Cycle Turbines	Piñon Pine Project Gasification Combined Cycle	Coal Unloading	Flare Stack Operation	Combined Continuous Sources Tracy + 2 CTGs + Piñon Pine
Nearest Residence	40.1	34.0	45.5	43.0	43.3	46.8
Patrick Community	28.0	22.9	33.2	30.1	31.6	34.6
Caretaker Residence	56.1	58.4	61.0	41.1	56.6	63.7
West Boundary	48.8	42.6	55.4	62.1	52.5	56.4
East Boundary	45.9	43.7	50.9	37.1	47.7	52.7
North Boundary	54.4	48.9	59.3	41.5	55.0	60.8

Noise modeling using the model NOISECALC (*Driscoll, 1984*) was conducted to ascertain expected noise levels. The results of the noise modeling at receptor locations are presented in Table 4.1.11-4. [More information is provided in the Health, Safety, and Noise Technical Report, available in the reading rooms (see Appendix H.)] These values represent the expected noise level at the receptor if each facility or combination of facilities were to be operated at full capacity. They were not integrated over time and did not take intermittency of operation into account. The combined levels shown in the last column represent normal operation without coal unloading or flare stack operation in progress. The proposed Piñon Pine Power Project equipment currently is projected to be louder than the existing Tracy Power Station (including the new simple-cycle combustion turbines). This is largely a result of the coal crusher and the many compressors and pumps associated with the coal gasification plant. The expected noise level of the project at the nearest residence would be 45.5 dBA. This level is considered quiet and would not constitute a noise impact.

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Coal unloading operations also would not produce a noise impact because the unloader is enclosed and resulting levels at residential receptors would be low at 43 dBA and 30 dBA at the nearest residence and in Patrick, respectively. Unloading operations would occur only about once a week for a duration of approximately 4 hours.

Infrequent operation of the flare stack would produce noise levels of approximately 43 dBA at the nearest residence and about 32 dBA in the community of Patrick. These levels would generally not be noticeable and their impact would not be significant.

Maximum noise levels on an octave band basis predicted at the property line were 59.5 dB in the 500 Hz band on the north boundary and 61.3 dB in the same band on the west boundary. These levels are well below the 84 dB maximum level allowed by the Storey County noise ordinance in the frequency range of 500 to 1,800 Hz.

Day/night noise levels ( $L_d$ ) were computed for the plant and associated coal-handling activities based on predicted levels. It was conservatively assumed that all plant activities, including coal unloading and flare stack operation, would take place at any time of the day or night. The intermittent nature of coal unloading and flare stack operation were taken into consideration. Furthermore, it was assumed that the continuous noise sources, including the existing Tracy units, the two additional simple-cycle combustion turbines (CTs), and the proposed Piñon Pine Power Project would operate at full capacity all the time.

Calculation of the  $L_d$  level requires that a 10-dBA penalty be added to predicted noise levels between the hours of 10 p.m. and 7 a.m. to account for the increased awareness of people to nighttime noise. Thus, the  $L_d$  level is always higher than the 24-hour average level.

The  $L_d$  levels associated with plant operations were then combined with the existing  $L_d$  levels at the modeled noise-sensitive receptor locations (the nearest residence and the community of Patrick) to show the total  $L_d$  level with the plant at full capacity. Table 4.1.11-5 presents the results of these calculations. Traffic currently is the primary noise source at the residential locations and would continue to be in the future.

The predicted  $L_d$  levels associated with the plant are below the existing  $L_d$  levels at all locations by a significant amount. When the predicted plant levels are combined with the existing  $L_d$  levels, the

increase is less than 1 dBA both at the nearest residence and in the community of Patrick. The upper range of existing  $L_d$  levels would be largely unaffected by addition of the proposed Piñon Pine Power Project to the Tracy Power Station. The small fractional increases described in Table 4.1.11-5 would not be noticeable or significant.

**Table 4.1.11-5. Day/night ( $L_d$ ) noise levels (dBA).**

Noise-Sensitive Receptor Location	Existing $L_d$	Tracy + Two CTs	Piñon Pine Project	Tracy + 2 CTs + Piñon Pine Project	Tracy + 2 CTs + Piñon Pine + Existing $L_d$
Nearest Residence	60 to 65	47.5	56.0	56.6	62 to 66
Community of Patrick	50 to 60	35.6	44.2	44.8	51 to 60

This preliminary assessment of noise impacts indicates that no significant impacts would be produced during normal operations of the project, even when combined with those from the existing Tracy Power Station, including additional simple-cycle combustion turbines. Coal delivery and unloading would not produce a noise impact because of the enclosed unloader and the large distance separating it from any receptor. The EPA guideline level of 55 dBA for the  $L_d$  currently is exceeded by the nearest residences. The addition of the proposed Piñon Pine Power Project would be expected to increase the noise level by 1 to 2 dBA for the nearest residences and only by 1 dBA for the community of Patrick. In addition, the Storey County noise ordinance limit of 84 dBA at the property line in the frequency range of 500 to 1,800 Hz would not be exceeded.

#### 4.1.12 Pollution Prevention

This section describes the efforts and procedures planned for the proposed action specifically related to pollution prevention, abatement, and control.

**Construction Impacts.** Activities planned during the construction phase of the proposed action include specific measures to prevent pollution. Fugitive dust emissions would be minimized during construction by water application, as necessary. BMPs would be implemented to control nonpoint source pollution discharges to surface water and groundwater; therefore, no degradation of water quality would be expected. For example, stormwater, if any, would be routed to the cooling pond to prevent discharge








of suspended material to the Truckee River. Only small amounts of hazardous and solid wastes would be expected during the 26-month construction phase.

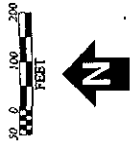
**Operation Impacts.** Existing Tracy Power Station pollution prevention measures described in section 3.12 would continue to be implemented. The proposed Piñon Pine Power Project would continue to operate as a "zero discharge" facility, ensuring that no discharge enters the Truckee River. In addition, several specific efforts have been proposed to reduce or eliminate pollution. Coal, coke, and limestone storage facilities would be designed to protect groundwater quality. When practical, used zinc-based desulfurization sorbents would be returned to the manufacturer for refurbishing and reuse instead of disposed. In addition, SPPCo. has hired a contractor to investigate potential applications of LASH and safe disposal options. Various uses for LASH are being evaluated so that the solid waste could be reused instead of disposed. Coal fines would be collected and consumed as fuel in the gasifier and consequently a potential disposal problem would be avoided. As previously discussed, SPPCo. also is making efforts to replace hazardous materials with less hazardous or non-hazardous substances. These substitutions reduce or eliminate the potential for adverse impacts from the use and disposal of hazardous materials.

## 4.2 Environmental Impacts of the No-Action Alternative

Under the no-action alternative, DOE would not provide cost-shared funding support for the proposed Piñon Pine Power Project. The advanced KRW gasification technology with hot gas cleanup probably would not be demonstrated, and the commercialization of the technology would be delayed or eliminated for economic reasons. Because utility and private sectors generally select known and demonstrated technologies over new unproven advancements, the opportunity to choose this clean coal technology directed at lowering SO<sub>x</sub> and NO<sub>x</sub> nationwide may be eliminated. The no-action alternative also would not fulfill the need for the proposed action as described in Chapter 1.

Should the DOE not fund the proposed project, the most likely course of action for SPPCo. to pursue would be the construction of essentially the same project, but without the capability of using coal fuel. The project would use natural gas with distillate oil as a secondary fuel source. The configuration of the natural gas and distillate oil combined cycle would include the same General Electric combustion turbine and a slightly smaller size steam turbine and auxiliary equipment selection as described for the Piñon Pine Power Project. The facilities associated with SPPCo.'s most likely course of action integrated with existing Tracy Power Station facilities are shown in Figure 4.2.1.

	Existing Structure
	Existing Road
	Fence line
	Railroad Spur
	Septic System
	Under Construction
	Structures that would be constructed as result of the no-action alternative



The following sections provide an analysis of potential impacts to human and environmental resources if DOE chooses not to provide funding for the proposed action.

#### **4.2.1 Setting**

Long-term impacts to the aesthetic qualities of the area would be similar to those described in section 4.1.1 for the proposed action. The plant would be built in the same location, west of the existing Tracy Power Station administration offices. However, the plant's size would be reduced from approximately 28 acres for the proposed action to 2.6 acres for a natural gas powered facility. The gasifier structure would not be built, but the stack and the cooling tower still would be constructed. In addition, no flare system would be required. During construction, standard dust-control measures would be employed to control fugitive dust emissions. The ¼ acre of Indian rice grass mixed with shrubs would not be disturbed. The same measures presented for the proposed action to reduce visibility impacts would be implemented: trees would be planted along the south bank of the Truckee River, and where appropriate, facilities would be painted in earth tones.

#### **4.2.2 Atmospheric Conditions**

In comparison to the proposed action, the use of natural gas would result in lower air emission rates. Emissions are estimated to be 53 tons/year of SO<sub>2</sub> (a 76.5 percent reduction from the proposed action); 482 tons/year of NO<sub>x</sub> (a 12 percent reduction); 63 tons/year of PM<sub>10</sub> (a 49 percent reduction); 135 tons/year of CO (a 56 percent reduction); and 429,000 tons/year of CO<sub>2</sub> (a 46 percent reduction). As in the case of the proposed action described in section 4.1.2.1, SPPCo.'s most reasonable course of action described here would operate in compliance with NAAQS standards and PSD program requirements. Ambient air concentrations in the nonattainment areas for CO, O<sub>3</sub>, and PM<sub>10</sub> would not be significantly impacted. In addition, no adverse impact to soil and vegetation would result. Secondary emissions associated with new employee vehicle emissions, train emissions, and truck emissions would be reduced compared to the proposed action because fewer construction and operations workers would be required, and the need for rail delivery of coal and the 50 weekly truckloads of LASH would be eliminated. Visibility impacts would be similar to those anticipated for the proposed action. As with the proposed action, SPPCo. would continue to work with NDOT to improve traffic safety during fog episodes.

#### **4.2.3 Geology and Soils**

Impacts to geology and soils from SPPCo.'s probable course of action resulting from the no-action alternative (construction and operation of a natural gas facility) would be similar to those described for the proposed action in section 4.1.3. Facilities would be designed and constructed in accordance with UBC Seismic Zone 4 guidelines. If an earthquake were to occur during operation and there was a breach of containment, the procedures delineated in the Chemical Emergency Resource Plan and Spill Prevention Control and Countermeasures plan would be followed to reduce or eliminate the extent of the potential impact. As with the proposed action, a design-level subsurface investigation program would be implemented and mitigation measures employed as warranted. However, it is estimated that only 22,800 cubic meters (30,000 cubic yards) or less of soil (approximately 75 percent less than for the proposed action) would be displaced during construction; best management practices would be employed to control erosion. No activity currently planned as a result of the no-action alternative would impact soil quality.

#### **4.2.4 Water Resources**

There would be an approximate 34 percent decrease in water consumption compared to the proposed action. Water conservation methods would be adopted and thoroughly described in required PSCN documentation if this option were to be adopted by SPPCo. BMPs would be implemented to control nonpoint source pollution discharges. SPPCo. would continue to monitor the cooling ponds to ensure adequate water quality. Discharges directed to a new lined evaporation pond would include 0.064 cfs for cooling tower blowdown (approximately 45 percent less than from the proposed action) and 0.015 cfs for demineralizer waste (approximately 45 percent less than from the proposed action). The dewatering that might be required during construction of the proposed action's coal unloading facility has been identified as the only potential activity that could influence groundwater flows. Since this facility would not be built for a natural gas powered facility, no impact to groundwater flow would be expected during construction. Chemical and hazardous waste storage facilities and handling procedures would be designed to prevent accidental spills and protect groundwater quality. As with the proposed action, the existing switchyard would be expanded within the 100-year floodplain (as designated by FEMA). If required, SPPCo. would comply with Storey County Code of Ordinances, Chapter 15.20, Flood Damage Prevention and obtain the necessary development permit. No facility would be constructed in a wetlands area.

#### 4.2.5 Land Use

Impacts to existing land use resulting from SPPCo.'s probable course of action if the no-action alternative were to be implemented would be similar to those described for the proposed action in section 4.1.5. Because the plant would be located at the same site, which is zoned industrial, a Special Use Permit would be required. The increase in average daily traffic levels would be insignificant and no increase in rail traffic would occur. Trucks transporting consumables, such as solvents, lubricating oil, and parts would fall within the maximum load rating capacity of the Tracy Bridge. If the proposed Tuscarora pipeline is constructed, it would end at the property line of the Tracy Power Station and SPPCo. would be responsible for extending the pipeline no more than 15 meters (50 feet). It should be noted that the decision to proceed with the pipeline is independent of any other decision pertaining to the Tracy Power Station.

#### 4.2.6 Biological Resources and Biodiversity

Impacts to biological resources and biodiversity from SPPCo.'s most reasonable course of action would be similar to those described for the proposed action in section 4.1.6. Because of the reduced spatial requirements (2.6 acres compared to 28 acres), there would be the potential for reduced habitat disturbance. Development would be located away from the river so increased fine sediment, which could impact aquatic ecosystems, is unlikely. In comparison to current conditions, operation of the new unit would require a slight increase in Truckee River diversion (approximately 1 cfs), and would not cause a *substantial* adverse impact to *fish populations in the river*. Overall, water quality in the cooling pond, which supports a number of warmwater fish, would continue to *support these species*. In addition, the evaporation ponds would not be expected to adversely impact wildlife, such as migratory waterfowl. No important, potentially limiting, or relatively rare habitat types, such as riparian woodland would be affected. However, construction and operation of this facility would temporarily and permanently displace some wildlife species that currently reside in the area. As stated previously, this impact would be less because less land would be disturbed. In addition, noise levels would not be as high as with the proposed action and no adverse impact to wildlife is expected. No threatened or endangered species would be adversely affected by construction or operation of this project. Biological diversity in the immediate vicinity of the plant and the surrounding region, although not vast, would be maintained.

#### 4.2.7 Cultural Resources

Impacts to cultural resources from SPPCo.'s most reasonable course of action would be similar to those described for the proposed action in section 4.1.7. Construction activities would be located further from potentially affected sites but SPPCo. would construct fences, as presented for the proposed action, to ensure protection. Because the railroad spur would not be extended, there is no possibility that activity would intrude on sites *26-St-194, -195, -196, and -197*. No Native American cultural resources nor any historic sites have been identified on the site; therefore, no adverse impact would be expected.

#### 4.2.8 Socioeconomic Resources

The proposed action has been identified as part of SPPCo.'s least cost, preferred plan for generation in its Electric Resource Plan (*SPPCo., 1993c*); therefore, failure to construct the proposed action possibly could result in a future rate increase to customers because user rates would be more susceptible to increases due to the volatility of the oil and natural gas market. Operation of the plant that most likely would be built as a result of the no-action alternative would provide 91 MW gross of the 20-year projected energy demand (12.5 percent less than the proposed action). There also would be a reduction in potential tax revenue because fewer construction and operations employees would be required. There would be no adverse impact to police protection, schools, health care, or parks and recreation. As in the case of the proposed action, no environmental justice impacts to low-income or minority communities would be expected.

#### 4.2.9 Health and Safety

Existing health and safety procedures (described in section 3.9) would be updated. Requirements, along with mitigation procedures, associated with coal delivery and processing would not be necessary; instead, requirements for handling of natural gas, including leak detection and prevention, would be included. Potential exposures to heavy metals during welding, soldering, grinding, and painting or to organic vapors from painting or cleaning operations would be possible, and like for the proposed action, would be evaluated during the construction phase. Noise attributed to coal handling and processing equipment (e.g., gasifier—88 dBA, coal unloading facility—81 dBA, coal crusher—86 dBA, locomotive—71 dBA, flare stack—87 dBA, all at 15 meters or 50 feet) would be eliminated. Unauthorized personnel would continue to be prevented from entering the project area by a perimeter

fence. The construction of and impacts from the new switchyard would be the same as for the proposed action. No adverse impacts to employee or the local population's health and safety would be expected.

#### **4.2.10 Hazardous and Toxic Materials/Waste Management**

Stipulations for the handling and transportation of solid wastes would be included in the Special Use Permit. The potential one year reduction (for every 60 years of plant operation) in the Lockwood Landfill's projected 122-year life span would not occur because the 134 tons/day of cooled LASH, expected from the proposed action, would not be generated. Small quantities of hazardous wastes (e.g., acetone, spent non-halogenated solvents, and waste oil) would be generated. The Tracy Power Station has an existing EPA hazardous waste generator identification number and hazardous wastes would be transported by a licensed transporter and disposed of at a permitted facility. Neither the zinc-based desulfurization sorbent nor low-level radiation sources would be used, but the same requirements and safeguards pertaining to steam generator cleaning and boiler feedwater treatment chemicals described for the proposed action would apply. Implementation of the procedures described in section 4.1.10 would ensure that no adverse impact would result from hazardous and toxic materials.

#### **4.2.11 Noise**

The elimination of coal processing activities from the project would reduce the number of noise-producing operations (as described in section 4.2.9). Steam blowing, the only activity identified for the proposed action that would result in a temporary, yet significant noise impact also would take place if a natural gas plant were to be constructed. The same mitigation measures relating to the notification and temporary relocation of nearby residents, on a voluntary basis, as described in section 4.1.11, would be implemented.

#### **4.2.12 Pollution Prevention**

Existing programs, such as recycling and replacing hazardous materials with nonhazardous or less hazardous materials, that currently are implemented at the Tracy Power Station (see section 3.12) would continue. The plant would remain a "zero discharge" facility, ensuring that no discharge would enter the Truckee River. In addition, as described in section 4.2.2, air emissions would be lower compared to the proposed action. Solid waste generation also would be less than with the proposed action.

## 4.3 Mitigation and Monitoring

### 4.3.1 Identification of Mitigation Measures

*This section describes all identified measures that could minimize both direct and indirect impacts to the environment from the construction and operation of the proposed Piñon Pine Power Project. Measures are described as falling into one of the following three categories:*

- (a) Measures that are considered part of the proposed project because —*
  - (1) They are part of the proposed design, or*
  - (2) They are standard construction practices or standard operating procedures;*
- (b) Additional measures that DOE considers either unique to the proposed project or necessary to minimize impacts associated with the proposed project; and*
- (c) Measures that have been considered but, at this time, are not part of the proposed project; however, these measures could potentially be selected by incorporation into the Record of Decision for the proposed action.*

#### 4.3.1.1 Setting

- (a1) The following measures have been incorporated into the design and are considered part of the proposed project:*
  - Fences if painted, would utilize non-reflective materials.*
  - Plant lighting would be limited to those areas requiring it for safety and operation and would be directed in a way to minimize light/glare impacts.*
- (b) The following mitigation measures are considered necessary to minimize impacts that would be associated with the proposed project:*

- *Trees (cottonwoods, poplars, and alders, etc.) would be planted on the south bank of the Truckee River to screen portions of the proposed facility. At maturation, the trees would provide screening for the lower 9-12 meters (30-40 feet) of the project.*
- *Where possible, portions of the proposed Piñon Pine Power Project would be painted in earth-tones, except for highlighting colors (yellow and red) needed for health or safety reasons. Structural steel would be silver/grey color to blend in with existing facilities.*

*(c) The following mitigation measures have been considered:*

- *Shrouding the flare would minimize the visual impact to the surrounding community. However, because the flare would be used intermittently (approximately 3 to 4 times per year) and the fuel gas flame would be of very low brilliance, when compared to plant and stack lighting, the incremental impact on visual resources would not be relatively minor, and thus shrouding is not considered necessary at this time.*

#### **4.3.1.2 Atmospheric Conditions**

*(a1) The following measures have been incorporated into the design and are considered part of the proposed project:*

- *Hot barrier filters in the hot gas cleanup section would remove essentially all remaining particulate matter from the desulfurized product gas.*
- *Airborne fines remaining entrained in the final exhaust flue gas would be removed by a fabric filter (baghouse).*
- *All material handling systems would be enclosed and supplied with dust collection systems.*
- *Air from the coal and limestone storage, conveying, and crushing areas would be exhausted through a fabric filter or similar collectors. The coal storage facility would be equipped with vent filters to control dust emissions.*

- *Dusts generated from coal crushing and screening would be collected in negative pressure hoods that would be vented through a pulse jet or similar baghouse.*
  - *Fines from dust collection would be returned to the storage or handling system and later used as fuel.*
  - *Air from the cyclone would be recycled through the system.*
  - *Exhaust from the limestone filling operation would be vented through a dust control filter system.*
  - *Coal and coke storage facilities, crushing operations, and pneumatic conveying of coal would be maintained under controlled atmospheres to minimize the possibility of spontaneous combustion.*
  - *Zinc-based sorbent would remove approximately 95 percent of the sulfur (not removed in the gasifier).*
  - *Western sub-bituminous/bituminous coals with low sulfur content would be burned.*
  - *A cooling tower using high-efficiency drift control methodology would be installed, thus reducing the potential for creating fog and icing hazards.*
- (a2) *The following measures are standard operating procedures and are considered part of the proposed project:*
- *Airborne exposure to LASH dust would be maintained at less than 1.0 mg/m<sup>3</sup>.*
- (b) *The following mitigation measures are considered necessary to minimize impacts that would be associated with the proposed project:*
- *Fugitive dust emissions would be minimized during construction by water application as necessary.*

- *SPPCo. would continue to work with the NDOT to improve travel safety during fog events. SPPCo. proposes to count the number of baseline fog days. Warning signs currently posted on I-80 are consistent with mitigation used in other areas prone to occasional fog.*

*(c) The following mitigation measures have been considered:*

- *SPPCo. evaluated the reliability, cost, energy, and environmental impacts of various control equipment that could potentially be used to control emissions of oxides of nitrogen (NO<sub>x</sub>), carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), and particulate matter (PM<sub>10</sub>) in a Best Availability Control Technology (BACT) analysis, which was submitted with the Prevention of Significant Determination (PSD) permit application. In addition to the NO<sub>x</sub> control technology incorporated into the proposed project (i.e., steam injection), advanced water or steam injection, dry low-NO<sub>x</sub> combustion, selective non-catalytic reduction (SNCR), and selective catalytic reduction (SCR) also were considered. For CO control, an oxidation catalyst was considered. Six acid gas removal technology options were considered for control of combustion turbine SO<sub>2</sub> emissions. Post-combustion control devices were considered for PM<sub>10</sub>. (This BACT analysis is presented in section 4.3.2.1.)*

**4.3.1.3 Geology and Soils**

*(a1) The following measures have been incorporated into the design and are considered part of the proposed project:*

- *All facilities would be constructed in accordance with Uniform Building Code (UBC) Seismic Zone 4 specifications.*
- *Best Management Practices (BMPs) would be used to control soil erosion during construction; soils disturbed would be either covered by gravel or stabilized by compaction or with an approved chemical soil binder.*
- *Design of the coal unloading station would be completed by a registered professional engineer.*

- *An erosion and sediment plan would be implemented.*
  - *A soil resistivity test program would be implemented and would be used in the design of underground features.*
- (b) *The following mitigation measures are considered necessary to minimize impacts that would be associated with the proposed project:*
- *A geotechnical report would be prepared which would include evaluation of the liquefaction potential of the near-surface, saturated, loose to medium dense sands; evaluation of the collapse potential of the soils beneath heavily loaded foundations; calculation of the settlement of individual footings; evaluation of corrosion potential; and excavation slope stability. Mitigating measures (such as excavating and removing loose to medium density materials) would be implemented if: soils are found liquefiable; soils are found to be collapsible; or settlements are found to exceed tolerable settlement values. If site soils are found to be highly corrosive, corrosion-sensitive components would be protected by cathodic protection.*
- (c) *The following mitigation measures have been considered:*
- *Specific design features (e.g., placing a filter to minimize soil migration) would minimize piping (erosion of soils caused by groundwater flow that emerges on a surface and carries particles of soil with it); but because the potential for piping is generally low, no measures are planned at this time.*
  - *Providing rock and cobble cover where higher channel flows are expected would minimize the impact from erosive stormwater, but since channel flows are not expected, this measure is not planned at this time.*

#### 4.3.1.4 Water Resources

- (a1) *The following measures have been incorporated into the design and are considered part of the proposed action:*

- *Best Management Practices would be implemented to minimize runoff and sedimentation.*
- *Surface runoff draining from areas of industrial activity would be directed to a filter or separator treatment device capable of removing entrained pollutants.*
- *The discharge of non-stormwater (process water or floor drains) from the proposed unit would be directed to the double-lined evaporation pond to prevent co-mingling with stormwater.*
- *The following water conserving measures have been incorporated into the design and are considered part of the proposed project:*
  - *A larger, more efficient plant than originally proposed would be constructed that would not require steam for sulfur sorbent temperature control.*
  - *A demineralized water system would be selected that would minimize the amount of water discharged to the new evaporation pond.*
  - *Recycling of boiler and cooling tower blowdown would occur.*
  - *Condensate from space heaters, auxiliary steam, and gland steam condensers would be recovered.*
  - *Vacuum pumps would be used instead of steam jet air ejectors for vacuum control.*
  - *Sample drains, not contaminated by reagents, would be recovered.*
  - *Additional transformer cooling capacity would be provided to avoid the need for water spray during peak loads.*
  - *Metal seated ball valves would be used to reduce steam/water leakage from drain and vent lines.*

- *Electric heat tracing would be used rather than steam heat tracing for freeze protection.*
- *Mechanical seals would be used instead of water cooled packing glands, where suitable.*
- *High level alarms would be placed on water storage tanks to reduce overflow occurrences.*
- *Conductivity alarms would be used on the demineralized water system to avoid contamination of storage tank contents.*
- *Water from the coal unloading sumps would be reused as makeup water for the dust suppression system.*
- *Use of the hot gas cleanup process (as opposed to conventional wet scrubbing methods for sulfur control) also would reduce water consumption.*

(a2) *The following measures are standard operating practices and are considered part of the proposed project:*

- *Nonpoint source pollution would be controlled through implementation of Best Management Practices (BMPs), such as measures to prevent petroleum product discharges; sediment controls limiting soil disturbance to the minimum necessary; vegetating and mulching denuded areas; diverting runoff away from denuded areas; and trapping sediment with sediment retention structures.*

(c) *The following mitigation measures have been considered:*

- *A temporary fence could be erected, if necessary, adjacent to wetlands areas to ensure that all construction activities would occur outside of the wetlands.*
- *In an effort to find ways to conserve water, alternative cooling methods were investigated. In addition to the option incorporated into the proposed action (use of wet*

*cooling in the form of a cooling tower), air condensers (dry cooling), a wet-dry cooling tower (hybrid cooling), a spray pond, a cooling pond with cooling tower, and a cooling tower were analyzed. Only the use of air condensers (dry cooling option) was shown to substantially reduce water consumption when compared to the other options; however, there were some economic and environmental disadvantages (as well as additional environmental advantages) associated with the dry cooling option. (This analysis is presented in section 4.3.2.2.)*

#### **4.3.1.5 Land Use**

*There are no mitigation measures associated with land use.*

#### **4.3.1.6 Biological Resources**

*(a1) The following measures have been incorporated into the design and are considered part of the proposed project:*

- The evaporation pond would be double-lined in accordance with Nevada Department of Environmental Protection (NDEP) guidelines. Monitoring wells would be installed to detect any leakage before it would reach the Truckee River.*
- Two perforated plate screens at the intake facility at the Tracy Power Station would prevent entrainment of fish from the Truckee River.*

*(b) The following mitigation measures are considered necessary to minimize impacts that would be associated with the proposed project:*

- SPPCo. would periodically test the evaporation ponds. If water quality is found to be hazardous to wildlife, SPPCo. would either neutralize the ponds' contents or work with NDOW to develop the necessary exclusion measures.*
- A soil erosion plan would be implemented to preclude increased fine sediment loads to the river.*

- *Habitat enhancement for Mule deer would be facilitated by planting food source plants to act as an attractant.*
- *Where appropriate, native vegetation would be planted.*
- *Topsoil removed from construction areas would be stored and placed on top of spoil areas to facilitate vegetation.*
- *Trees would be planted along the riverbed to provide shade from direct sunlight and inhibit warming of river water.*

(c) *The following mitigation measures have been considered:*

- *Monofilament lines placed in a 25-foot space grid have been successful in deterring use of open water by birds that have a circling landing pattern (such as gulls and geese). However, it is not intended for use as an exclusionary device for all wildlife. Since the evaporation pond is not anticipated to be hazardous to wildlife, utilization of this method is not planned at this time.*
- *Mechanically planting seed mixtures in areas now devoid of vegetation would enhance the terrestrial ecosystem; but because this vegetation would be a fire hazard, this measure would not be implemented.*

4.3.1.7 Cultural Resources

(b) *The following mitigation measures are considered necessary to minimize impacts that would be associated with the proposed project:*

- *Archaeological site 26-St-191 would be protected by a permanent 6-foot chain-link fence. A temporary chain link fence would be constructed between the railroad line and sites 26-St-194, -195, -196, and -197.*

(c) *The following mitigation measures have been considered:*

- *If during construction, crews encounter buried deposits, construction activities would halt until a professional archaeologist, in consultation with the State Historic Preservation Office (SHPO), could evaluate the find.*

#### **4.3.1.8 Socioeconomic Resources**

(c) *The following mitigation measures were considered:*

- *Staggering work hours would minimize the impact to traffic volume due to the proposed project. But since the increase in traffic associated with construction and operation of the proposed Piñon Pine Power Plant would be less than 3 percent, this is not deemed necessary at this time.*

#### **4.3.1.9 Health and Safety**

(a1) *The following measures have been incorporated into the design and are considered part of the proposed project:*

- *A perimeter fence would remain intact. Additional fencing would be constructed to secure new facilities to deter intrusion by unauthorized persons.*
- *Engineering controls would be implemented to control fugitive coal dust.*
- *Leak detection would be required in enclosed areas containing flanges.*
- *Wastewater and wastewater sediments would be reclaimed, thus minimizing wastes and the potential for adverse impacts to workers from handling and disposing of these wastes.*
- *Safety considerations for high-pressure systems would be implemented to minimize potential impacts from the accidental release of pressure during normal operations.*

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- *Workers would be trained on proper management of coal dust to minimize the likelihood of a fire or dust explosion.*
- (a2) *The following measures are standard operating procedures and are considered part of the proposed project:*
- *Compliance with SPPCo.'s corporate Respiratory Protection Program.*
  - *Compliance with SPPCo.'s corporate Hazard Communication Program.*
  - *Compliance with SPPCo.'s corporate Chemical Hygiene Program.*
  - *Compliance with SPPCo.'s corporate Hearing Conservation Program.*
  - *Compliance with SPPCo.'s corporate Bloodborne Pathogens Program.*
  - *Compliance with SPPCo.'s corporate Steam Plant Tagging Rules (Lockout/Tagout) Program.*
  - *Compliance with SPPCo.'s corporate Confined Space Entry Program.*
  - *Hand-held leak detectors would be used during leak detection and repair programs.*
  - *A regimented field safety program would be instituted by Foster Wheeler.*
  - *All employees who are required to wear a negative pressure respirator would be provided with a medical questionnaire and undergo pulmonary function testing under a physician's review.*
  - *All employees required to work with radiation sources would be required to wear personal dosimeters.*

#### **4.3.1.10 Hazardous and Toxic Materials/Waste Management**

**(a1) The following measures have been incorporated into the design and are considered part of the proposed project:**

- *The LASH storage silo would be designed to prevent rainwater runoff and wind dispersal of particles.*
- *Control measures to minimize the release of toxic gases have been incorporated into the design of the desulfurization system.*

**(a2) The following measures are standard operating procedures and are considered part of the proposed project:**

- *The transportation, storage and handling of the sorbent would be performed in accordance with all applicable regulatory requirements and safety guidelines.*
- *Care would be taken to avoid exposure to sorbent by requiring that personal protective equipment be worn.*

**(c) The following mitigation measures have been considered:**

- *If possible, LASH would be reused rather than disposed. Studies are currently underway to determine the potential for reuse and improved alternatives for disposal of the LASH. (This analysis is presented in section 4.3.2.3.)*

#### **4.3.1.11 Noise**

**(b) The following mitigation measures are considered necessary to minimize impacts that would be associated with the proposed project:**

- *The temporary (1- to 2-week period) and short-duration (about 2½ minutes each) steam blowing activity would produce audible, and potentially disruptive, levels of noise. Prior to the initiation of steam blowing, letters of explanation would be sent to the nine*

*residences in the area to avert the potential concern that a problem may exist at the power plant. Because high noise levels at night would likely cause sleep interference at the nearest residence, SPPCo. would mitigate the impact by temporarily relocating, on a voluntary basis, the affected residents to a hotel in the Reno/Sparks area. This impact, and mitigating measure, would take place only during the construction phase.*

#### **4.3.1.12 Pollution Prevention**

**(a1)** *The following measures have been incorporated into the design and are considered part of the proposed project:*

- *Hydrazine (a carcinogen) would not be used for steam cycle corrosion control (a non-hazardous oxygen scavenger would be used instead).*
- *Gaseous chlorine would not be used for cooling water treatment; a water soluble solid or liquid bromine/chlorine material would be used instead.*

**(a2)** *The following measures are standard operating practices for SPPCo. and would be part of the proposed project:*

- *Compliance with SPPCo.'s strategic plan dedicated to vigorous environmental actions, which includes pollution control, hazardous waste reduction, and energy efficiency.*
- *Participation in corporate recycling program for paper, aluminum, copper, and other materials.*
- *Participation in corporate programs for recovery and reuse of antifreeze, freon, and various solvents.*
- *Compliance with SPPCo.'s Spill Prevention Control and Countermeasures Plan.*
- *Covers would be placed over or berms placed around drains to prevent oil spills from entering the drainage system.*

- *Oil storage tanks would be surrounded by large earthen berms.*
- *Transformers would be surrounded by earthen berms for secondary containment.*
- *Spill prevention equipment, such as covers, caps, gaskets, pumps, valves, fittings, and diking would be maintained and operated in a manner that prevents failures, leaks, spills, and other incidents that could result in the release of oil.*
- *Best Management Practices (BMPs) would be implemented to control nonpoint source discharges to surface water and groundwater.*
- *The proposed plant would operate so that no point source discharges would occur into the Truckee River.*

#### ***4.3.2 Analyses of Potential Mitigation Measures***

*Efforts to minimize impacts in three areas involved a number of options that could be evaluated and compared with each other. Consequently, SPPCo. performed (or is performing) detailed analyses for air emissions control, cooling, and LASH reuse options. [The LASH reuse analysis was presented as Appendix G in the Draft EIS.]*

##### ***4.3.2.1 Air Emissions Control Options Analysis***

*The proposed Piñon Pine Power Project must use Best Available Control Technology (BACT) to control the emissions of oxides of nitrogen (NO<sub>x</sub>), carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), and particulate matter (PM<sub>10</sub>). The BACT analysis performed for the proposed project involved an analysis of the reliability, cost, energy, and environmental impacts of various control equipment that could potentially be used to control emissions of these identified air pollutants. The first step was to compile a comprehensive list of feasible control options for each pollutant subject to Prevention of Significant Deterioration (PSD) review. These control options were then ranked and listed in order of overall control effectiveness in descending order, with the most effective control option at the top of the list. The second step was to determine the potential economic, energy, and environmental impacts the control option would have on the proposed project, starting at the top of the list. The last step was to propose the most effective control (which was not eliminated in the second step) as BACT.*

*Vendor quotes and engineering estimates were used as the basis for calculating the total capital and operating costs, or cost differentials, for control options. Standard engineering economic analysis was used to convert all costs to equivalent levelized annual costs, so that the pollution control cost-effectiveness, in dollars-per-pound-of-pollutant-controlled, could be calculated for comparison with other control options.*

*Two forms of energy impacts that may be associated with a control option can normally be quantified. Increases in energy consumption resulting from increased heat-rate may be shown as total Btus or fuel consumed per year or as Btus per ton of pollutant controlled. Reduced unit availability due to a control option are expressed in kilowatt-hours per year.*

*The primary focus of the environmental impact analysis is the reduction in ambient concentrations of the pollutant being controlled. Increases and decreases in other criteria or noncriteria pollutants may occur with some technologies, and these also were identified. Non-air impacts, such as solid waste disposal and increased water consumption, can also be an issue.*

#### **4.3.2.1.1 Oxides of Nitrogen**

*Oxides of nitrogen ( $\text{NO}_x$ ) are generated by two mechanisms in combustion turbines, primarily by the fixation of atmospheric nitrogen in the flame, called thermal  $\text{NO}_x$ , but also by the conversion of nitrogen chemically bound in the fuel, called fuel-bound nitrogen (FBN). Most natural gas has little or no FBN, while some low-Btu coal gases, from gasifiers with hot gas cleanup, contain some fuel-bound nitrogen. The combustion modification techniques usually available to control  $\text{NO}_x$  emissions in combustion turbines are ineffective in controlling the formation of  $\text{NO}_x$  from FBN.*

*The rate of generation of thermal  $\text{NO}_x$  is an exponential function of the flame temperature, while the amount of  $\text{NO}_x$  generated is also a line function of the time that the gases remain at the flame temperature. Thus, temperature and residence time are the primary variables that control the  $\text{NO}_x$  emission level.*

*Current technologies used or proposed for use to control combustion turbine NO<sub>x</sub> emissions include:*

- *Water or steam injection;*
- *Advanced water or steam injection;*
- *Dry low-NO<sub>x</sub> combustion;*
- *Selective non-catalytic reduction (SNCR); and*
- *Selective catalytic reduction (SCR).*

*Water or Steam Injection.* *Water or steam injection is the most commonly used technology for NO<sub>x</sub> control on combustion turbines. Water or steam can be injected directly into the combustion zone to reduce the flame temperature in the combustor, thus limiting the amount of thermal NO<sub>x</sub> formed. During gas-firing operations, this is accomplished by injection through separate concentric annular spaces in the fuel manifold. Water or steam injection is generally capable of reducing exhaust gas NO<sub>x</sub> concentrations during gas firing to approximately 42 parts per million by volume (ppmv) on a dry basis, referenced to 15 percent oxygen (Fitts and Miller). This technology has been used successfully on various types of combustion turbines (both industrial and aircraft derivatives) for many years and has been found to be a reliable and economical means of controlling NO<sub>x</sub> emissions.*

*Advanced Water or Steam Injection.* *Combustion turbines using advanced water or steam injection are equipped with redesigned combustion chambers to allow for increased water or steam injection rates without causing excessively rapid equipment breakdown from high dynamic pressure-induced oscillation. The conventional General Electric (GE) Frame 6B and 7F combustion turbine combustion chamber designs include one nozzle for fuel injection. The "quiet combustor" (a registered trademark of GE), on the other hand, consists of six nozzles, and uses a redesigned steam injection piece that significantly reduces dynamic pressures. As a result of these design changes, exhaust gas NO<sub>x</sub> concentrations of 25 ppmvd referenced to 15 percent oxygen can be achieved for natural gas operation with only a moderate increase in the deterioration rate of machine hardware, using the comparatively low [ $< 1,149^{\circ}\text{C}$  ( $2,100^{\circ}\text{F}$ )] firing temperature of the GE Frame 6B and 7F engines. This technology is being used in some existing cogeneration projects in California, and is proposed for a number of other projects throughout the country.*

*The engine which has been specified for use in the proposed Piñon Pine Power Project is a GE model MS6001FA (Frame 6F) combustion turbine. This engine operates at firing temperatures of*

1,260°C (2,350°F) and should not be confused with a conventional Frame 6B engine (which is an entirely different engine). NO<sub>x</sub> formation increases with flame temperature; and with increased flame temperatures diluent must be injected at a higher rate for a Frame 6F for the NO<sub>x</sub> emissions rate to be equal to that of a Frame 6B or 7F.

The heat content of the coal gas would be an estimated 130 Btu/scf, which is quite low when compared to natural gas, which has an approximate heat content of 900 to 1200 Btu/scf. As low-Btu coal gas would be the primary fuel for this proposed facility, the specialized GE combustor was designed to accommodate the large volumes of coal gas and the consequently different fuel/air mixtures that would be necessary to attain the 633 MMBtu/hr maximum heat input for the turbine.

The "quiet combustor" (or equivalent) design, therefore, would not be a technically feasible option for a unit that must be capable of firing large volumes of low-Btu coal gas. In addition, the increased water or steam injection rates associated with this advanced technology may actually extinguish the flame of the already low-Btu coal gas.

Dry Low-NO<sub>x</sub> Combustion. Dry low-NO<sub>x</sub> combustion designs control and stage the fuel and air flows within the combustion zone to minimize thermal NO<sub>x</sub> formation by limiting the peak combustion temperature or residence time. Fuel staging and air staging within the combustion zone may be used to establish fuel-lean or fuel-rich zones (above or below the stoichiometric amount of combustion air) to minimize flame temperatures. Several manufacturers have been involved in the development of dry low-NO<sub>x</sub> combustion systems during the last decade, which are capable of achieving NO<sub>x</sub> levels as low as (and in some cases, lower than) steam or water-injected combustion turbines with improved performance and reduced dynamic pressure activity.

GE has reported that by the end of 1992, more than 50,000 fired hours had been accumulated on GE dry low-NO<sub>x</sub> combustion systems for Frame 6, 7, and 9 combustion turbines. Dry low-NO<sub>x</sub> systems guaranteed by the company to achieve single-digit NO<sub>x</sub> levels are available for all current production GE combustion turbines for delivery by 1995 (Diesel & Combustion Turbine Worldwide, 1993). The GE dry low-NO<sub>x</sub> combustor design essentially uses massive amounts of excess air to quench the peak flame temperature. The proposed Piñon Pine Power Project's GE 6F would use the inert gas in the coal gas to quench the peak flame temperature to achieve the same effect as the GE dry low-NO<sub>x</sub> combustor.

However, there is no GE dry low- $\text{NO}_x$  combustor available for low-Btu coal gas combustion. This is partially due to the larger volume of coal gas that must be combusted. Therefore, this natural gas fired dry low- $\text{NO}_x$  combustor technology would be considered technically infeasible for the proposed Piñon Pine Power Project. Additionally, the very low calorific value of the proposed project's coal gas could constitute a dry low- $\text{NO}_x$  system.

Selective Non-Catalytic Reduction (SNCR). The selective non-catalytic reduction process (SNCR) is a generic label that refers to several distinct post-combustion processes, which involve the injection of urea, ammonium hydroxide, anhydrous ammonia, or aqueous ammonia downstream of the furnace/combustion zone within an appropriate temperature window to reduce  $\text{NO}_x$  to elemental nitrogen ( $\text{N}_2$ ) and water ( $\text{H}_2\text{O}$ ). SNCR is a relatively simple, though highly sensitive, process.

The typical optimum temperature range is 871 to 982°C (1,600 to 1,800°F), although additives and enhancers—such as oxygenated hydrocarbons—can be introduced to the formulation to extend the window. In the case of urea, if temperatures are too high, additional  $\text{NO}_x$  can form; if too low, emissions of unreacted ammonia (ammonia slip) will be too high. A high degree of flow and temperature modeling may be required to determine the appropriate point in the furnace/combustion zone for reagent injection (Kohland Riensen Field, 1985).

This technology has been widely applied to fluidized-bed-boilers and to biomass-fired plants requiring additional  $\text{NO}_x$  reduction. Several demonstrations of SNCR have gone forward on coal-fired utility boilers. The process is being used commercially by several large oil/gas-fired utility boilers in southern California, which has a severe ozone problem. However, as exhaust gases exiting from the proposed combustion turbine are at a temperature of approximately 538°C (1,000°F), this technique would be ineffective. Additionally, ammonia injecting directly into the combustion zone has been investigated by turbine manufacturers and determined to be impractical.

Selective Catalytic Reduction (SCR). Selective catalytic reduction (SCR) involves the injection of ammonia into the flue gas stream where it selectively reacts with  $\text{NO}_x$  in the presence of oxygen ( $\text{O}_2$ ) and a catalyst to form molecular nitrogen and steam. Because the pertinent reactions normally proceed at temperatures between 871 and 982°C (1,600 and 1,800°F), a catalyst is used to promote the reactions at lower temperatures. Although the exact catalyst composition is proprietary, the use of base metal oxides for both the active and support materials has been generally acknowledged (vanadium pentoxide, titanium dioxide, or noble metal). Newer, more sulfur-resistant ceramic catalysts have

recently been used. The temperature range required for this catalytic reduction process is typically between 299 and 399°C (570°F and 750°F), which usually exists within the high pressure boiler section of the Heat Recovery Steam Generator (HRSG). Generally, this requires that the high pressure evaporator tube bank of the HRSG be split to accommodate the SCR unit. If the catalyst bed is not located in the proper temperature zone of the HRSG, the reaction efficiency will be reduced if the temperature is too low. Ammonia slip or catalyst damage may occur if the temperature is too high.

Selective catalytic reduction has been adopted by various air pollution control agencies for combustion turbines. The maximum NO<sub>x</sub> removal efficiency of an SCR system is generally 80 to 90 percent when initially installed on natural gas-fired units. When used with standard water or steam injection, the resulting exhaust gas NO<sub>x</sub> concentrations for natural gas firing are typically around 9 ppmvd. When used in conjunction with dry low-NO<sub>x</sub> combustion, exhaust gas NO<sub>x</sub> concentrations for firing on natural gas have been measured as low as 3.5 ppmvd. However, due to the very different composition of the coal gas that would be burned at the proposed facility, NO<sub>x</sub> exhaust concentrations this low would not be feasible.

SCR is considered a proven technology for base-loaded natural gas-fired combustion turbine/HRSG operation. Base-loaded units operate at a near constant load, thus providing a constant energy output throughout its yearly operation. The proposed Piñon Pine Power Project is expected to operate as a base-loaded unit. The temperature profile in the HRSG of a base-loaded turbine remains constant with time throughout the turbine operation. Since the catalyst can only be located in one fixed place within the HRSG, it would experience near constant temperatures that are within the design temperature window of the catalyst. Additionally, NO<sub>x</sub> concentrations would be consistent, facilitating ammonia injection and thus minimizing ammonia slip.

To maintain SCR performance at the design removal efficiency of 80 percent, flue gas conditions must not vary significantly from the design point. Performance is not guaranteed by vendors for exhaust conditions that vary more than 10 percent from design.

A drawback of the SCR technology as applied to combined-cycle facilities is its inability to work effectively during startup and shutdown. Combustion turbine emissions occurring while the steam turbine is brought online cannot be controlled if the design flue gas conditions and the catalyst temperature do not meet the conditions previously described. Existing combined-cycle units equipped with SCR systems have air permits with exemptions from emission limits during a "deadband" of up

to 5 hours at startup and shutdown. Therefore, operation of SCR could not be guaranteed, except when the HRSG has achieved full capacity production.

A second concern associated with SCR technology is the effect of sulfur-bearing fuels on the catalyst. The problems associated with the use of sulfur-bearing fuels are due to the formation of ammonium bisulfate [ $\text{NH}_4\text{HSO}_4$ ] and ammonium sulfate [ $(\text{NH}_4)_2\text{SO}_4$ ], ammonia salts formed by the chemical reaction between the sulfur in the fuel and the ammonia injected for  $\text{NO}_x$  control. These salts are emitted to the atmosphere as particulate matter.

Ammonium bisulfate ( $\text{NH}_4\text{HSO}_4$ ) is a sticky substance that forms in the lower temperature section of the HRSG where it deposits on the walls and heat transfer surfaces. The surface deposits result in increased pressure drop, reduced heat transfer and power output, and lower cycle efficiency. To prevent corrosion damage, the HRSG must be shut down periodically and water-washed, thereby reducing availability. While ammonium sulfate [ $(\text{NH}_4)_2\text{SO}_4$ ] is not corrosive, its formation also contributes to plugging and fouling of the heat transfer system, leading to reduced heat transfer efficiency and higher particulate emissions.

Also of concern is the handling and use of ammonia. Ammonia use in the SCR chemical process for  $\text{NO}_x$  control presents several problems. Ammonia is on the EPA list of extremely hazardous substances under Title III, Section 302 of the Superfund Amendments and Reauthorization Act of 1986 (SARA). Releases of ammonia to the atmosphere may occur in several ways, including ammonia slip, or it can be accidentally released during transport, transfer, or storage. In addition, concerns about the potential health impacts of secondary emissions, such as nitrous oxide and nitroamines, have been raised (Schorr, 1991).

Of greater concern than ammonia slip, is the accidental release of ammonia. Studies performed to determine the potential impact of an accidental release of stored anhydrous ammonia on a surrounding community indicate that it could be a major public safety issue. Employing aqueous ammonia is considered the safer option, even though the costs associated with it are greater than those with anhydrous ammonia. By limiting the stored ammonia concentration to less than 40 percent, the volatilization rate is greatly reduced. Any release to the environment will disperse faster due to the slower release and lower ammonia concentration (Schorr, 1991).

*Another serious problem associated with SCR technology is the disposal of spent catalyst. SCR catalyst materials typically contain heavy metal oxides such as vanadium and/or titanium, thus creating a human health and environmental risk related to the handling and disposal of spent catalyst. Vanadium pentoxide is on the EPA's list of Extremely Hazardous Substances and some states have declared the spent catalyst from SCR to be a hazardous waste. The quantity of waste associated with SCR is quite large (although the actual amount of active material in the catalyst bed is probably quite small). The presumption can therefore be made that catalyst disposal could be fairly costly. In addition, regulations pending in several states prohibiting or restricting the importation or transportation of hazardous materials could make it very difficult to dispose of such wastes.*

*In spite of these serious concerns, environmental, economic, and energy impacts were evaluated for SCR, assuming that, for this purpose, it would be a feasible option despite the fact that it would present risks to the proposed Piñon Pine Power Project in terms of a potential loss in generating revenues in the event of facility shutdown due to SCR failure.*

*Feasible NO<sub>x</sub> Control Options. In summary, the two viable means of controlling combustion turbine NO<sub>x</sub> emissions from this proposed project would be steam/water injection and selective catalytic reduction (SCR). Although some serious problems and concerns were identified with the use of SCR for this proposed project, it still was considered a viable technology and economic costs were developed for its use. An SCR system capable of reducing NO<sub>x</sub> emissions from a base case of 42 ppm to 4.5 ppm was evaluated first in accordance with the "top down" approach.*

*Impacts of Combustion Turbine NO<sub>x</sub> Control Options.*

*An important cost component of SCR is catalyst replacement. Due to concerns associated with the impact of sulfur-containing coal gas on catalyst life, it was assumed that catalyst replacement would occur at two-year intervals rather than the standard vendor guarantee of 3 years. In addition, one spare catalyst would be maintained onsite to minimize downtime. Capital and operating cost calculations for SCR (assuming 8,760 hrs/yr operation on coal gas) are summarized below:*

*Total Levelized Annual Costs:*

<i>Total Capital Cost</i>	<i>\$ 769,809</i>
<i><u>Total O&amp;M Costs</u></i>	<i><u>\$1,887,774</u></i>
<i>TOTAL</i>	<i>\$2,657,583</i>

*If NO<sub>x</sub> emissions from a combustion turbine with steam injection was 42 ppm, this would equal 1,112,960 lbs/yr based on 8,760 hours of operation firing a low-Btu coal gas. An SCR system capable of reducing NO<sub>x</sub> from 42 ppm to 4.5 ppm on coal gas would therefore remove:*

$$1,112,960 \text{ lbs/yr} - (4.5 \div 42) \times (1,112,960 \text{ lbs/yr}) = 993,714 \text{ lbs NO}_x \text{ /yr}$$

*It should be noted that the cost and emission estimates provided are for an operation of 8,760 hours per year. Thus, the minimum NO<sub>x</sub> removal cost (which represents the maximum operating scenario) is as follows:*

$$\begin{aligned} \text{NO}_x \text{ removal cost-effectiveness} &= \frac{\$2,657,583/\text{yr}}{993,714 \text{ lbs/yr}} = \$2.67/\text{lb NO}_x \\ &= \$5,349/\text{ton NO}_x \end{aligned}$$

*The economic analysis for an SCR system for this proposed project shows that the NO<sub>x</sub> removal costs are high.*

*Facility energy losses associated with the use of SCR technology for the combined cycle emissions can be quantified. The presence of the SCR catalyst in the flue gas steam causes a de-rating of 100 kW and cost an additional \$51,000 per year in lost generating capacity revenues. The increase in pressure drop across the catalyst would have to be compensated for by increased fuel firing (at a higher heat rate). This heat rate penalty associated with the use of SCR is 12 Btu/kW-hr. The forced outage rate is also expected to increase for a unit equipped with SCR due to unscheduled maintenance of ammonia injection and monitoring systems, and catalyst cleaning or replacement to maintain performance. This would reduce the power output even further.*

*The application of SCR to control NO<sub>x</sub> emissions from combustion turbines would require large amounts of ammonia to be stored on site. As stated previously, the storage and use of significant amounts of ammonia creates the potential for releases of ammonia into the atmosphere through transportation and delivery accidents, human error, and equipment malfunction. The likelihood of an accident occurring during transportation and delivery would be increased by the fact that the closest aqueous ammonia supplier identified to date is in Lathrop, California. Any large release of ammonia due to an accident, such as tank or line rupture, could require the evacuation of nearby residents and*

on-site employees. Based on continuous SCR operation (8,760 hours per year), approximately 1,287,720 lbs/yr of aqueous ammonia would be consumed.

Also stated previously, another environmental impact associated with the use of SCR is the need to dispose of large quantities of spent catalyst material. The catalyst manufacturers would take back the spent catalyst; however, none have indicated that they would regenerate it. Ultimately, many tons of spent catalyst material would have to be disposed of every 2 years, causing an added solid waste problem. The prevention of any solid waste increase has an overall environmental benefit in Nevada. In addition, metallic catalysts have been declared a hazardous waste in some states due to their heavy metal content (Schorr 1989). Vanadium pentoxide is on the EPA's list of extremely hazardous substances and is a Resource Conservation and Recovery Act (RCRA) hazardous material.

Additionally, the 100 kW derating of the unit (resulting from the SCR pressure drop) would require an increase in electrical generation from other existing units within the SPPCo. system. These units emit pollutants at a significantly higher rate (relative to the proposed Piñon Pine Power Project), which would offset a portion of the emission reduction achieved by the SCR.

In addition to having potential negative environmental impacts, the use of SCR would provide limited environmental benefits to the area. Atmospheric dispersion modeling was performed to determine air quality impacts. The results are presented in Table 4.3.2-1.

Table 4.3.2-1. Oxides of nitrogen standards, significance criteria, and project impacts.

Averaging Time	AAQS $\mu\text{g}/\text{m}^3$	PSD Significant Impact Level $\mu\text{g}/\text{m}^3$	Predicted NO <sub>x</sub> Impacts	
			Proposed Technology $\mu\text{g}/\text{m}^3$	With SCR $\mu\text{g}/\text{m}^3$
Annual	100	1	0.90	0.09

While the use of Selective Catalytic Reduction would reduce NO<sub>x</sub> emissions below those associated with the steam injection technology, the environmental benefits of these reductions are

minimal since emissions from steam/water injection are already below levels considered insignificant. This cost is high considering the reduction in  $\text{NO}_2$  impacts that would be achieved; the expected annualized cost of this technology would be \$5,349/ton. In addition, there are potential environmental consequences associated with the handling and storage of ammonia, and the disposal of spent catalyst.

Based on this analysis, the control technology selected for the combustion turbine was steam injection with low fuel-bound nitrogen conversion to ammonia in the gasifier. This technology was the minimum degree of control considered in this analysis and is capable of achieving maximum  $\text{NO}_x$  emissions of 42 ppm when firing coal gas.

Analysis of Other  $\text{NO}_x$  Table 4.3.2-2. Summary of  $\text{NO}_x$  emission sources.

Emission Sources. Other sources of  $\text{NO}_x$  emissions that would be associated with this project are the flare system, sulfation combustor, startup heaters, and coal dryer. Table 4.3.2-2 is a summary of the maximum  $\text{NO}_x$  emissions that would be attributed to each source.

Emission Source	$\text{NO}_x$ (TPY)
Flare	0.7
Sulfation combustor	16.4
Startup heaters	0.5
Coal dryer	0.8
TOTAL	18.4

An annual total of 18.4 tons per year of  $\text{NO}_x$  would be emitted by all of these other sources. This would represent a small increase, especially when compared to annual combustion turbine  $\text{NO}_x$  emissions of 557 tons per year. Therefore, there would be little associated air quality benefit from imposing further reductions from these sources. As such, the current designs of these sources, in conjunction with good combustion practices and efficient operation, is proposed for the control of their  $\text{NO}_x$  emissions.

#### 4.3.2.1.2 Carbon Monoxide

Formation of CO in a combustion process is the result of the incomplete combustion of the fuel. In an ideal combustion process, all carbon contained in the fuel is oxidized to form  $\text{CO}_2$ . Ideal combustion occurs under high temperatures and sufficient excess air, both of which favor  $\text{NO}_x$  production. With the  $\text{NO}_x$  emission control equipment selection, higher CO emissions can be expected

*due to the less efficient combustion associated with wet injection technologies. CO emissions could be controlled by either good combustion practices or oxidation catalysts.*

*With water or steam injection, combustion efficiency is decreased. This is especially true in the case of low-Btu coal gas combustion. This combustion inefficiency results in higher emissions of carbon monoxide. Efficient design and operation, however, minimize CO (as well as NO<sub>x</sub> and VOC) emissions. Good combustion practices with water or steam injection have been shown to reduce CO emissions significantly.*

*The only practical post-combustion control method for the reduction of CO emissions is the oxidation catalyst. Exhaust gases from the combustion source are passed over a catalyst bed where oxygen in the flue gas (excess air) oxidizes the carbon monoxide to carbon dioxide. The temperature range for this process is approximately 315 to 649°C (600 to 1,200°F), with the highest removal efficiencies occurring in the upper temperature range.*

*Physical damage to the oxidation catalyst would occur when the catalyst temperature window is exceeded. Carbon monoxide removal efficiencies are guaranteed to be 80 percent initially (from an emission value of 25 ppm to 5 ppm). The vendor guarantees emissions of 25 ppm. Actual emissions are expected to be significantly less.*

*An oxidation catalyst would experience the same operating problems as those discussed for the SCR catalyst, except that no reagent injection would be required. Sulfur containing low-Btu coal gas firing would present similar operating problems as those for SCR, which may result in premature loss of activity and deterioration of performance. Oxidation catalyst vendors also generally do not guarantee catalyst performance for any period of operation firing fuel with any appreciable sulfur content. Thus, it would be necessary to keep at least one spare catalyst on-site to minimize downtime and maximize emissions control compliance.*

*An operational disadvantage of the oxidation catalyst on sulfur-containing fuels is conversion of SO<sub>2</sub> to SO<sub>3</sub>. Significant amounts of SO<sub>2</sub> may oxidize to SO<sub>3</sub>, increasing the potential for acidic corrosion of the HRSG, ductwork, and stack, and increasing sulfate emissions.*

*Impacts of Combustion Turbine CO Control Options. An oxidation catalyst previously was identified as the only viable alternative CO control measure. The economic impacts associated with*

*an oxidation catalyst capable of reducing CO emissions by 80 percent (from an emission level of 25 ppm to 5 ppm) were based on 8,760 hrs/yr operation on low-Btu coal gas. Operation and maintenance costs associated with the oxidation catalyst include performance penalties due to the pressure drop and catalyst maintenance and replacement. Annual capital and operating costs are summarized below:*

<i>Total Levelized Annual Costs:</i>	
<i>Capital Cost</i>	<i>\$167,639</i>
<i><u>O&amp;M Costs</u></i>	<i><u>\$421,880</u></i>
<i>TOTAL</i>	<i>\$589,519</i>

*Turbine CO emissions using good combustion practices were calculated based on an exhaust concentration of 25 ppm, equal to 31.7 lbs/hr at an ambient temperature of 10°C (50°F). Reductions in carbon monoxide emissions, based on 80 percent control, would be:*

$$(277,692 \text{ lbs CO/yr}) \times (0.80) = 222,154 \text{ lbs CO/yr}$$

*The CO removal cost was determined in the following manner.*

$$\begin{aligned} \text{CO Removal Cost} &= \frac{\$589,519/\text{yr}}{222,154 \text{ lbs CO/yr}} = \$2.65/\text{lb CO} \\ &= \$5,307/\text{ton CO} \end{aligned}$$

*The energy losses associated with the use of an oxidation catalyst for CO control include reduced electrical output and increased fuel consumption due to increased back-pressure, as well as lost generating capacity associated with shutdowns for catalyst change-out, maintenance, and replacement.*

*The use of a CO catalyst would result in an approximate reduction in facility energy output of 50 kW. In addition, the CO catalyst would cause a turbine heat rate penalty of 6 Btu/kWh. This would equate to additional necessary heat input of 5,309 MMBtu/yr (additional heat input calculations based on the turbine firing coal gas at 633 MMBtu/hr for 8760 hrs/yr).*

*Although the use of a CO catalyst does not require the storage and use of hazardous chemicals at the site, the technology produces an indirect environmental impact because of the need to dispose of large quantities of spent catalyst material. The oxidation catalyst manufacturers have indicated they would take back the oxidation catalyst. However, the same disposal problems would exist as those discussed for the SCR catalyst.*

*As a minor environmental benefit, the oxidation catalyst is expected to oxidize an unspecified amount of unburned hydrocarbons. The conversion efficiency for hydrocarbons and volatile organic compounds (VOCs) is generally much lower than that for CO and is not guaranteed by catalyst suppliers.*

*The application of an oxidation catalyst would only have a limited impact on air quality. The predicted maximum CO impacts, with and without the use of a catalyst, are compared in Table 4.3.2-3.*

*Table 4.3.2-3. Carbon monoxide standards, significance criteria, and project impacts.*

Averaging Times	National AAQS $\mu\text{g}/\text{m}^3$	PSD Significance Impact Level $\mu\text{g}/\text{m}^3$	Predicted CO impacts	
			Proposed Technology $\mu\text{g}/\text{m}^3$	With CO Catalyst $\mu\text{g}/\text{m}^3$
1-Hour	40,000	2,000	48.6	9.7
8-Hour	10,000	5,000	12.9	2.6

*Thus, ambient CO impacts of the facility would be well below levels considered significant, with or without the CO catalyst. The use of a catalyst to control CO emissions from the turbine would provide no significant environmental benefit to offset lost grid power and the associated emissions resulting from the need to replace lost generation.*

*In summary, the use of an oxidation catalyst to control CO emissions would provide a small environmental benefit at a cost of \$5,307/ton and would result in an annual turbine heat rate penalty*

of 5,309 MMBtu/yr when firing coal gas. In addition, the facility would suffer a power penalty of 50 kW with the use of the CO catalyst. These factors, plus the low emission levels that would be achieved by the turbine alone, make the use of add-on controls, such as an oxidation catalyst, unattractive. Consequently, the current turbine design, in conjunction with good combustion practices, is proposed for the control of CO emissions.

Analysis for Other CO Emission Sources. Other sources of CO emissions associated with the proposed project include the flare system, sulfation combustor, startup heaters, and coal dryer. CO emissions resulting from these sources (an annual total of 0.4 TPY) would be considered small when compared to the TPY of CO emitted by the combustion turbine. There would be no substantial environmental benefit to installing post-combustion controls (such as an oxidation catalyst) on these sources. As such, the current designs of these units, in conjunction with good combustion practices and efficient operation, is proposed for the control of CO from these minor sources.

The sulfation combustor would emit 164 TPY. The only post-combustion method for controlling these emissions — the oxidation catalyst — has never been demonstrated in this capacity. Furthermore, the exhaust gases from this incineration-type system would be approximately 204°C (400°F) below the 315 to 649°C (600 to 1,200°F) temperature range specified for the oxidation catalyst. Therefore, the current design of the sulfation combustor, as well as the use of good combustion practices and efficient operation, is proposed for the control of CO emissions from this unit.

#### 4.3.2.1.3 Sulfur Dioxide

Sources of sulfur dioxide would include the combustion turbine and gasification system sulfate combustor. The coal dryer and flare would also contribute a very small amount of SO<sub>2</sub>.

Of the three proposed fuels, the backup fuels (natural gas and propane) contain very little sulfur and as a result, SO<sub>2</sub> emissions and impacts would be well below significant levels. The SO<sub>2</sub> emissions during coal gas operation would be controlled by use of low sulfur coal as a feedstock and pre-combustion sulfur reduction in the gasifier.

Emissions of SO<sub>2</sub> from the combustion turbine during coal gas firing would be minimized through a combination of in-gasifier desulfurization with a limestone desulfurizing medium, and external (to the gasifier) desulfurization using a zinc-based sorbent compound. The design coal

*planned for the proposed Piñon Pine Power Plant would contain approximately 0.40 percent sulfur by weight. About 30 percent of this sulfur would be captured by the limestone added to the gasifier with the coal feed, 60 percent would leave the gasifier in the raw fuel gas produced, and 10 percent would remain in the unconverted char that goes to the sulfation combustor.*

*The remaining sulfur compounds in the gas stream would be removed after gasification using a zinc-based sorbent. The sulfur in the raw fuel gas would be principally hydrogen sulfide ( $H_2S$ ) with some carbonyl sulfide (COS). These compounds would be removed from the fuel gas in zinc-based catalytic desulfurizers that are designed to remove all but a trace (about 20 parts per million by weight) from the product fuel gas. A zinc-based system was selected as the external-bed sorbent for high-temperature coal gas desulfurization because of its effectiveness and capability for sulfur sorption combined with its regenerative characteristics. The preliminary design of the external desulfurization system consists of zinc-based sorbent in pressure vessels, and an exit-gas cooler. The sorbent in the vessels would be used to capture the  $H_2S$  while one vessel would be regenerated. All sulfur removal from the product gas would be done in these vessels. It is expected that the combination of in-bed limestone addition and external zinc-based desulfurization would achieve a 97 percent sulfur removal efficiency.*

*Raw coal gas from gasification would contain two major reduced sulfur compounds, hydrogen sulfide, and COS. These compounds would exist in equilibrium at gasification conditions. The COS level would be higher if a higher sulfur feed were to be gasified. Unlike  $H_2S$ , COS would not be as easily removed from the raw coal gas. Additional removal of COS would be accomplished by converting it to  $H_2S$  by hydrolysis and recycling this gas through the processing unit.*

*There are numerous processes that have been used to remove sulfur compounds at low temperatures from gas derived from solid fuels. Most processes use solvents from the petroleum refining, natural gas, and fertilizer industries for this purpose with predictable performance. Some of these solvents depend on physical adsorption and others depend on chemical affinity. These characteristics would effect the selectivity of sulfur adsorption from a coal gas containing high levels of  $CO_2$ .*

*Post-combustion  $SO_2$  controls, such as flue gas desulfurization (FGD), are considered to be technically infeasible for combustion turbine exhaust streams, because of the low  $SO_2$  concentration*

*present in a voluminous gas stream. They may cause a high pressure drop across an FGD system and its use would create a solid waste by-product (requiring proper disposal).*

*The proposed Piñon Pine Power Project would demonstrate hot fuel gas cleanup technologies. By maintaining the fuel gas at 538°C (1,000°F), significant thermal efficiencies would be retained. There are very limited sulfur removal technologies available for use in the 482 to 593°C (900°F to 1,100°F) temperature range. Prominent among them is the use of a zinc-based mixed metal oxide sorbent for sulfur-compound removal.*

*Table 4.3.2-4 shows six alternative gas purification technologies and their corresponding sulfur removal efficiencies. Technology #3 (iron oxide dry) requires a large space allocation, is labor intensive, and is the only technology presented in the table that can be used in high temperature applications. A serious drawback of technology #5 (liquid phase iron) is the fact that the solution has a relatively low capacity for hydrogen sulfide, requiring large liquid circulation rates and large facilities for handling the precipitated sulfur.*

*A comparison of the sulfur removal efficiencies for the listed technologies shows that only one, technology #6 (dimethyl ether of polyethylene glycol) has the capacity to equal or exceed the 97 percent sulfur removal design condition of the IGCC component of the proposed facility. The literature indicates that this process essentially can achieve complete removal of all sulfur compounds. However, the economic, environmental, and energy impacts would be prohibitive while providing an insignificant air quality benefit.*

*Higher removal efficiencies for technologies #1 through #5 would require modification to include hydrolysis of COS to the more readily absorbed H<sub>2</sub>S.*

*Therefore, a combination of in-bed limestone desulfurization and zinc-based external bed reactors is proposed for combustion turbine SO<sub>2</sub> emissions. This proposal takes advantage of the unique capability of this gasification process for in-gasifier sulfur removal and demonstrates a hot gas cleanup method, resulting in energy savings by eliminating the need to reheat the flue gas. The alternatives addressed would require gas cooling, negating this advantage and resulting in wasted energy and associated cost.*

Table 4.3.2-4. Comparison of acid gas removal technology options.

<i>Equivalent Alternative Technologies</i>		<i>COS % Removal</i>	<i>H<sub>2</sub>S % Removal</i>	<i>Total Sulfur % Removal</i>
#1	<i>Amine Absorption with Thermal and catalytic sulfur recovery</i>	16	95	95
#2	<i>Aqueous Ammonia Absorption with thermal catalytic sulfur recovery</i>	16	90	90
#3	<i>Iron oxide dry Oxidation process with sulfur recovery (elemental)</i>	0	100	96
#4	<i>Alkaline Salt Absorption with thermal and catalytic sulfur recovery</i>	16	90	87
#5	<i>Liquid Phase Iron Oxide oxidation process with sulfur Recovery (Elemental)</i>	16	90	87
#6	<i>Dimethyl ether of polyethylene glycol Absorption with thermal and catalytic sulfur recovery</i>	50+	100	98+

Reference: Kohl and Riensfeld, 1985.

Analysis for Other SO<sub>2</sub> Emission Sources

Projected emissions of SO<sub>2</sub> from the coal dryer and flare would be considered negligible, as each source would be projected to emit less than 10 pounds per year of SO<sub>2</sub>. The sulfation combustor, which would be essentially part of the facility's pollution control system, would be expected to have SO<sub>2</sub> emissions as high as 37.5 lbs/hr, as an unreacted by-product from the calcium sulfate production process.

The mixture of calcined limestone, calcium sulfide, and fines from the gasifier would be fed to the sulfation combustor to react with SO<sub>2</sub> in the regeneration gas from the zinc-based reactors. The

calcium oxide-SO<sub>2</sub> reaction would be exothermic and, at temperatures below 871°C (1,600°F), would be accomplished with little release of sulfur dioxide. It would produce calcium sulfate, a compound similar to gypsum, which could be used in wallboard manufacturing or readily disposed of in a Class I landfill. SO<sub>2</sub> emissions from the sulfation combustor correspond to 7 percent of the sulfur in the coal feed, representing an overall 92 percent control for the entire project with respect to sulfur in coal. Sulfation combustion systems equipped with exhaust gas desulfurization are not considered economically feasible for this process based on the already high level of SO<sub>2</sub> control.

#### 4.3.2.1.4 Particulate Matter (TSP AND PM<sub>10</sub>)

All particulate matter is assumed to be less than 10 microns for the proposed combined-cycle facility firing low-Btu coal gas, natural gas, and propane; thus total suspended particulate (TSP) equals PM<sub>10</sub>.

PM<sub>10</sub> emissions arise primarily from noncombustible materials present in trace quantities in combustion fuels. As a practical matter, turbine fuel specifications generally require trace metals in the fuel be kept to no more than a few parts per million to mitigate the potential deleterious action of PM<sub>10</sub> on combustion turbine blades. Other sources of PM<sub>10</sub> include condensable organics and minerals in the injection steam and PM<sub>10</sub> present in the combustion air.

The use of clean burning fuels such as coal gas, natural gas, and propane, is considered to be the most effective means for controlling TSP and PM<sub>10</sub> emissions from combustion equipment. The coal gas produced by the proposed Piñon Pine Power Project would undergo extensive gas stream particulate removal. The product gas would be passed through a high efficiency cyclone and a hot gas cleanup system to remove virtually all of the remaining particulates from the gas. The hot gas cleanup system would use barrier-type filters. This hot gas cleanup system (with a 99 percent control efficiency) would ensure virtually particulate free fuel gas to the combustion turbine.

Post-combustion alternatives such as baghouses, scrubbers, and electrostatic precipitators are undesirable due to the high pressure drops associated with them and the small amount of PM<sub>10</sub> reduction which would occur since the combustion turbine PM<sub>10</sub> emissions are minimal. In addition, these post-combustion control devices would be essentially infeasible for this application because of the large volume of exhaust gas stream associated with combustion turbines, as well as the minimal concentration of PM<sub>10</sub> which would be present in the exhaust.

*The project proposes to use virtually particulate-free fuel gases such as coal gas (from the facility's gasifier which has a 99 percent efficient hot gas cleanup system), natural gas, and propane for the control of PM<sub>10</sub> emissions from the combustion turbine. Particulate air quality impacts using this control strategy would be below both applicable ambient air quality standards/increments levels. In addition, the use of a post-combustion control device, which would provide practically no environmental benefit, would not be feasible for this facility because of the low concentration of PM<sub>10</sub> in the large volume of exhaust gas.*

#### *Analysis for Other PM<sub>10</sub> Emission Sources*

*In addition to the particulate matter emissions that would result from the cooling tower and the other combustion sources proposed for this proposed facility (i.e., the flare, sulfation combustor, startup heaters, and coal dryer), fugitive dust emissions (dust or particles that escape the material handling equipment) would arise from the coal gasification system operations. These emissions would result from the unloading, transfer, and storage of coal.*

*The proposed Piñon Pine Power Project would employ state-of-the-art particulate matter and fugitive dust control measures. Particulate matter emissions resulting from the natural gas or propane-fired flare, sulfation combustor, natural gas or propane-fired start-up heaters, and coal dryer (an annual total of 17.8 TPY from all four sources) would be considered minor. As such, the addition of post-combustion control devices to these sources (such as baghouses and electrostatic precipitators) would be impractical. Therefore, the use of clean burning fuels (coal gas, natural gas, and propane) is proposed for the control of PM<sub>10</sub> emissions from these minor sources.*

*Particulate matter emissions would also arise from the total suspended solids (TSS) that would be present in the drift losses associated with the proposed facility's cooling tower. High efficiency drift eliminators would be employed to limit drift losses of the total water flow in the cooling tower. The use of these high efficiency drift eliminators is proposed for the control of PM<sub>10</sub> emissions from the cooling tower.*

*State-of-the-art control measures in the form of vent filters and pulse jet bin-type collectors for fugitive dust emissions from the coal gasification system operation; from the unloading, transfer, and storage of coal; from coal crushing and screening; from limestone and solids handling systems; from*

*conveyors and transfer points; during coal and limestone pressurization hoppers; and solid waste handling systems are also proposed.*

#### **4.3.2.2 Cooling Options Analysis**

*Coal and other fossil fuels contain chemical energy which may be converted to other useful forms (heat, electricity) by controlled combustion processes. In the process of converting coal, or other fuels, to electric power, only a fraction of the fuel's thermal energy is converted to electric power. The proposed Piñon Pine Power Project is expected to convert approximately 40 percent of the coal's thermal energy to electricity. This compares to 30-36 percent for the best of the conventional coal-fired plants. Heat not converted to electric power is rejected into the atmosphere, primarily through the exhaust stack and the cooling system. A higher conversion percentage represents a more efficient use of the fuel.*

*A cooling system is used throughout the plant to cool various process streams and process equipment and to condense the steam turbine exhaust, which is by far the largest load on the cooling system. Various options exist for rejecting to the atmosphere the heat removed from the process.*

*During the early design phases of the proposed project, SPPCo. investigated ways to reduce water consumption. As part of these investigations, analyses were performed on various available methods that could be used for cooling the heat from turbine exhaust flows. These options included:*

- a cooling pond;*
- a cooling pond with cooling tower;*
- a cooling tower;*
- a spray pond;*
- a wet-dry cooling tower; and*
- air condensers.*

**Cooling Pond.** An evaporation cooling pond of approximately 90 acres and 3 meters (10 feet) deep was sized. It included double lining and a sump in which three circulating water pumps were installed to circulate cooling water to and from the steam turbine surface condenser.

**Cooling Pond with Cooling Tower.** An evaporation cooling pond of approximately 30 acres and 3 meters (10 feet) was sized. It included double lining and a sump in which three circulating water pumps were installed for pumping cooling water to an adjacent cooling tower. This cooling tower was used to share the heat load with the cooling pond by circulating the cooling water through the tower and finally discharging the water back to the plant surface condenser. The cooling tower was a three-cell, counterflow induced draft design of wood construction. It was fitted with three 150 horsepower fans. The tower was approximately 9 meters (30 feet) wide, 33.5 meters (110 feet) long, and 9 feet (30 feet) high.

**Cooling Tower.** A stand-alone cooling tower was sized for the total plant heat load requirement. The tower was a three-cell, counterflow, induced draft design of wood construction. It was fitted with three 150 horsepower fans. The tower was approximately 11 meters (36 feet) wide, 40 meters (130 feet) long, and 9 meters (30 feet) high, equipped with three circulating water pumps.

**Spray Pond.** A seventeen acre, 2-meter (6-foot) deep double lined spray pond was sized. There were 20 floating spray coolers on the pond's surface. Each cooler was powered with a 25 horsepower spray drive. Cooling took place as each cooler pumped pond water up into an evaporative spray pattern within the ponds surface and boundaries. Water was circulated back to the surface condensers through an adjacent sump and three circulating water pumps.

**Wet-Dry Cooling Tower.** A wood counter flow, induced draft tower design was utilized for this analysis. It incorporated both an air-cooled (dry) heat exchanger section as well as the direct contact (wet) section incorporating standard fill material. Upon entering the cooling tower the water flowed through the dry tube coil arrangement (dry section) then was directed to the wet fill area for final heat removal. The tower was equipped with three 200 horsepower motor driven fans and was approximately 11 meters (36 feet) wide, 38 meters (126 feet) long, and 14 meters (45 feet) high, equipped with three circulating water pumps.

**Air Condensers.** Air-cooled condensers are a form of direct dry cooling. In the system analyzed, ten 150 horsepower motor driven fans were incorporated. The air condenser was

approximately 18 meters (60 feet) in height. It was configured as being 2 bays wide by 5 bays in length with each of the bays incorporating a 24-foot diameter fan.

#### 4.3.2.2.1 Comparison I: Water Usage and Total Operating Horsepower

Initially, these cooling options were assessed from the standpoint of water usage and total operating horsepower required. The data presented in Table 4.3.2-5 shows that the cooling tower and the spray pond were almost identical for both water makeup needs and required horsepower. The air condenser option required approximately 33 percent higher operating horsepower, while reducing the amount of water used by 92 percent, compared to the cooling tower option. The cooling pond required 33 percent less water and 39 percent less horsepower than the cooling tower. The wet-dry cooling tower consumed 17 percent less water and required 33 percent more horsepower to operate than the cooling tower.

Table 4.3.2-5. Cooling options water usage and horsepower requirements comparison.

Cooling Option	Total Makeup Water (gpm) <sup>1</sup>	Total Horsepower Required (Operating)
Cooling Pond	515	576
Cooling Pond with a Cooling Tower	642	1030
Cooling Tower	768	946
Spray Pond	766	944
Wet-Dry Cooling Tower	634	1258
Air Condenser	60 <sup>2</sup>	1259

<sup>1</sup> Includes both blowdown and evaporative losses.  
<sup>2</sup> Total for blowdown and evaporation losses for the 2500 gpm aux. cooling tower.

4.3.2.2.2 Comparison II: Costs

*The same six options were examined from a cost impact point of view. Costs evaluated included expenditures for material and labor associated with capital equipment such as ponds with excavation, cooling tower and basin with excavation, surface condenser and auxiliaries, circulation pumps and piping. The following assumptions were used:*

- *Labor was based on a 40-hour work week utilizing union labor forces;*
- *The cost of all construction utilities was assumed to be by the client;*
- *All excavated material was assumed to be non-hazardous;*
- *Excavated material was assumed to be spread nearby on-site with no offsite disposal required;*
- *The site was assumed to be free of aboveground and underground obstructions;*
- *It was assumed that piling and rock excavation would not be required;*
- *It was assumed that no dewatering would be required;*
- *Liners for the ponds were considered to be double-lined without monitoring equipment;*
- *It was assumed that 1.2 meters (4 feet) of cover would be used in trenching for pipe and conduit duct;*
- *Spray nozzle motors for the spray pond were assumed to be powered by a local switch rack near the pond; and*
- *It was assumed that chain link fencing would be included around all cooling pond configurations.*

In addition, the following incremental costs per square foot were used for estimating the cost of the ponds:

Cooling Pond	\$4.85/square foot
Cooling Pond with Cooling Tower	\$4.90/square foot
Spray Pond	\$3.50/square foot

The results of this analysis are provided in Table 4.3.2-6. Because the cooling tower was found to be the least expensive of the options, it was used as a base against which the other options were compared.

Table 4.3.2-6. Cooling options costs comparison.

Cooling Option	Capital Costs	Evaluated Costs <sup>1</sup>	Total Cost	Increased Costs Compared to Least-Cost Option
Cooling Pond	\$26,800,000	\$6,920,000	\$33,720,000	\$19.3 M
Cooling Pond with a Cooling Tower	\$16,400,000	\$10,225,000	\$26,625,000	\$12.3 M
Cooling Tower	\$5,500,000	\$8,844,000	\$14,344,000	0
Spray Pond	\$9,300,000	\$9,071,000	\$18,371,000	\$4.0 M
Wet-Dry Cooling Tower	\$7,500,000	\$11,620,000	\$19,120,000	\$4.8 M
Air Condenser	\$10,500,000	\$11,596,000	\$22,096,000	\$7.8 M

<sup>1</sup> Based on water costs, 25-year book life, two-part (capacity and energy) energy consumption costs, and fixed charge rate on a capital basis.

**4.3.2.2.3 Comparison III: Efficiency, Coal Usage, and Air Emissions**

*The information presented in Table 4.3.2-5 illustrated that the most water conserving option would be the use of air condensers (dry cooling). Consequently, subsequent analyses were performed to compare the efficiency, coal usage, and air emissions effects for the air condensers (dry cooling) option with the least-cost (cooling tower/wet cooling) option. In addition, analyses of the wet/dry (hybrid) cooling option was also performed.*

*Option A: Air Condensers, a 100% Dry Cooling Option (in comparison to a cooling tower). There would be an approximate 640 KW decrease in generating capacity with the use of air condensers compared to the wet cooling tower option because, in part, to the inability of air condensers to condense down to vacuum. This partial vacuum translates to a decrease in delta pressure ( $\Delta P$ ) across the turbine, leading to slightly less efficient operations. In addition, the air condensers (dry cooling) option would need an increase of 250 KW in parasitic power primarily to power the fans. These two effects equate to a 890 KW penalty, which is approximately a 0.94 percent loss compared to wet cooling tower operations. Based on an average coal feed rate of 715.8 lbs/MWh, 637.1 lbs/hr more coal feed would be needed to compensate for this loss. This is equivalent to 15,290 lbs/day (approximately 7.64 tons/day) or an approximate increase of 2,790 tons/year in coal usage.*

*Also, the gross capacity of the power plant using air condensers must be increased by approximately 4.3 MW to compensate for higher backpressures (which lead to a smaller  $\Delta P$  across the turbine, thereby decreasing the efficiency of the plant). To maintain a net output of 95 MW, another 13,480 tons/year of coal would be required. Therefore, the total penalty for using air condensers (dry cooling) in terms of coal usage would be the need for an additional 16,270 tons/year of coal. This translates to an approximate increase of 5.5 percent in air emissions compared to the same plant using a cooling tower (at full load, 100 percent capacity factor), as shown in Table 4.3.2-7. (It should be noted that information in peer-reviewed journal articles have estimated the emissions "penalty" for dry versus wet cooling to be between 5 and 7 percent.)*

*Option B: Hybrid Cooling, a 50% Dry Cooling/50% Wet Cooling Option (in comparison to a cooling tower). The actual mix of any wet and dry parallel cooling system would be temperature- and operation mode-dependent. For estimation purposes, it is unlikely that the worst case would exceed a 50 percent use of dry cooling. Thus, by extrapolating information from the air condenser analysis (Option A) to 50 percent, an additional 8,135 tons/year of coal would be required. This translates to*

**Table 4.3.2-7. Comparison of air emissions (tons/year) for wet cooling tower and air condenser cooling systems.**

<i>Air Emission</i>	<i>Cooling Tower</i>	<i>Air Condensers</i>	<i>Approximate Increase in Emissions</i>
<i>Sulfur Dioxide</i>	225	237	12
<i>Oxides of Nitrogen</i>	575	607	32
<i>Particulate Matter</i>	135	142	7
<i>Carbon Monoxide</i>	304	321	17
<i>Carbon Dioxide</i>	790,000	833,450	43,450

an increase of approximately 2.7 percent in air emissions compared to the same plant using a cooling tower (at full load, 100 percent capacity factor), as shown in Table 4.3.2-8.

**Table 4.3.2-8. Comparison of air emissions (tons/year) for cooling tower and hybrid cooling options.**

<i>Air Emission</i>	<i>Cooling Tower</i>	<i>Hybrid Cooling (50% dry cooling, 50% wet cooling)</i>	<i>Approximate Increase in Emissions</i>
<i>Sulfur Dioxide</i>	225	231	6
<i>Oxides of Nitrogen</i>	575	590	15
<i>Particulate Matter</i>	135	139	4
<i>Carbon Monoxide</i>	304	312	8
<i>Carbon Dioxide</i>	790,000	811,330	21,330

#### 4.3.2.2.4 Comparison IV: Other Impacts

*There are other "generic" impacts or comparisons that can be made between wet cooling (e.g., cooling tower) and dry cooling (e.g., air condensers) options. The information provided in Table 4.3.2-9 is presented as a qualitative rather than quantitative comparison.*

#### Consequences of Cooling Option Selection

*Because one purpose of conducting this analysis was to determine ways to conserve water, an evaluation of the impacts of withdrawing less water was performed. The water savings associated with using the most water-conserving option (air condensers) when compared to the wet cooling technology would be 1.3 cfs (or 941.2 acre-feet/year). Realistically, SPPCo. would follow one of three scenarios for the disposition of this unused 1.3 cfs. It would either:*

- use the full 1.3 cfs as a resource for its current or future operations at Tracy Station;*
- use a portion of the 1.3 cfs at Tracy Station and use the remainder at another location;*  
*or*
- use a portion of the 1.3 cfs at Tracy Station and not use the remainder.*

*If SPPCo. decided not to exercise its water rights and use the full 1.3 cfs (third scenario), the Pyramid Lake Paiute Indian Tribe could potentially receive the additional unappropriated water if all other water rights holders had received their water. During periods of low flow (when some water rights would not be met), the potential savings of up to 1.3 cfs could mean that more water would be available for junior water rights, such as the Newlands Irrigation Project, (again, this would only happen if SPPCo. chooses not to use this 1.3 cfs for another purpose). If the air condenser (dry cooling) option is not incorporated into the proposed project and SPPCo. withdraws the anticipated 1.4 cfs for wet cooling, it would not affect water rights for any water rights holder during periods of normal and high-flow; all water rights would be met. During periods of low flow, withdrawal of the full 1.4 cfs could impact more junior water rights holders. Since the Pyramid Lake Paiute Indian Tribe holds the most senior water rights, it would not be affected by this additional withdrawal.*

Table 4.3.2-9. Cooling options — Environmental impacts comparison.

<i>Environmental Issue</i>	<i>Dry (Air Condenser) versus Wet (Cooling Tower) Cooling Options</i>
<i>Footprint</i>	<i>In most cases, the footprint for the dry cooling option would be much larger than for the wet cooling (cooling tower) option. Oftentimes it is on the order of 3 to 4 times the footprint required. Location of air condensers at the proposed site could potentially be a factor.</i>
<i>Noise</i>	<i>Air condensers would be much noisier than cooling towers with respect to operation. Decibel estimates are not available; however, this qualitative effect is often mentioned in review articles as a disadvantage associated with the use of air condensers.</i>
<i>Fogging/icing</i>	<i>The use of air condensers would virtually eliminate any concerns regarding fogging and/or icing potential associated with plume emissions from cooling towers.</i>
<i>Aesthetics</i>	<i>Air condensers would probably be more "visible" or noticeable from short distances because of their size and the fact that they would not "blend" with existing structures.</i>
<i>Plume Visibility</i>	<i>Air condensers would eliminate any concerns regarding the visibility of the plume.</i>
<i>Risk of Freezing</i>	<i>Freeze protection and elimination of non-condensables would be typical issues associated with air condensers. Recent design improvements lessen the probability of a freeze event; however, this improvement would be typically at the expense of higher capital and operating costs.</i>
<i>Availability/ Reliability/Risk</i>	<i>There would be more technical risk associated with the use of air condensers because their development has not progressed as far as cooling towers. Air condensers have been typically utilized in conjunction with small plants, with two notable exceptions: the 330-MW minemouth Wyodak power plant near Gillette, WY (1977) and the 466-MW minemouth San Juan 3 power plant near Farmington, NM (1978). Most dry-cooled projects since the 1980s have been almost exclusively small-scale cogeneration or waste-to-energy plants. U.S. utilities have indicated that there are concerns with dry cooling regarding cost and reliability.</i>
<i>Chemical Treatment of Cooling Water and Treatment and Disposal of Blowdown</i>	<i>The use of air condensers would virtually eliminate issues or concerns related to chemical treatment of cooling water (i.e., biocides) and treatment and/or disposal of blowdown.</i>

*The analyses performed determined that the use of air condensers (dry cooling) would have a negative environmental impact (e.g., on biota) because of increased air emissions. There would also be an additional economic burden for SPPCo. associated with the use of the dry cooling option. This higher cost could potentially be reflected in an increase in rates. In addition, from an operational point of view, the wet cooling tower option would be superior to the dry cooling option when operating in a harsh (freezing) environment. The wet cooling tower also would require less plot area for installation as well as contribute less noise compared to the air condensers. On the other hand, air condensers would virtually eliminate concerns regarding fogging and/or icing, visibility of plumes, and chemical treatment and/or disposal of blowdown when compared to wet cooling towers.*

#### **4.3.2.3 LASH Reuse Options**

A number of possible industrial uses for LASH were identified in section 4.1.10. This *section* provides additional detail on activities relating to the industrial use of LASH that currently are taking place. SPPCo. has contracted with Praxis Engineers, Inc. to investigate several issues regarding LASH, including the following:

- Identification of potential applications for LASH;
- Assessment of local markets for LASH applications;
- Generation of applications data through preliminary testing; and
- Confirmation of safe disposal options for LASH.

Praxis will be conducting a technical evaluation of LASH for a number of high- and medium-volume applications such as cement raw material, landfill cover, structural fill, flowable fill, and aggregate in road construction (base and subbase) and cement concrete. This will be done by comparing the physical and engineering requirements of each potential application with initial estimates of the characteristics of LASH and LASH blends to assess potential by-product applications. To prioritize the applications deemed technically viable, a market assessment will be performed to identify applications that are appropriate for the proposed Piñon Pine Power Project.

Application-specific data will be generated by preliminary testing for two or three potential applications using a simulated sample of LASH generated in the laboratory or prepared by blending power plant wastes derived from the proposed project coal. Results from these tests will be compared to corresponding data from conventional materials. The development of safe utilization applications requires a considerable amount of testing and evaluation over a period of several years, therefore, improved disposal techniques for LASH as a solid waste will be developed as an interim measure.

A technical evaluation of LASH characteristics will be conducted to identify potential applications. Initially, all available data related to the characterization of LASH will be examined, including data collected from earlier permitting work, data being developed for design of the ash sulfation reactor and materials handling equipment, and other data collected during process development (which may not necessarily be based on the coal that will be used by SPPCo. for the proposed Piñon Pine Power Project). Based on the review of existing data, additional characterization tests will be identified and conducted as necessary, using a small sample of LASH.

Useful characterization data include the quantitative elemental composition, ionic species, material phases, particle size and shape, and surface area. LASH is a composite of coal ash, unreacted quicklime, and calcium sulfate and sulfide phases, therefore, identification of the quantity and hydration state of the lime and calcium sulfate is of particular importance from a utilization perspective. Following a review of the characterization data, a technical assessment of potential applications will be performed using the requirements from target applications as guidelines.

A market survey of construction materials that are targeted for substitution by LASH will be conducted by reviewing industry publications and other sources to gather production and consumption figures for target materials. Major potential users of these materials will be contacted to discuss current and future needs. Procurement specifications and industry and American Society for Testing and Materials (ASTM) requirements will be evaluated, and the potential for marketing LASH to specific industry segments will be identified. Potential contacts include Nevada Cement, which has been identified as both a potential user of LASH and a supplier of limestone to the proposed project, and state and local highway departments.

Likely candidates for LASH reuse include:

- Cement raw material;

- Construction fill applications (flowable and structural fill);
- Soil stabilization;
- Agricultural and soil conditioner; and
- Construction aggregates (road construction—base and sub-base; cement concrete mix).

Raw materials required for cement production include limestone ( $\text{CaCO}_3$ ), shale rich in silica ( $\text{SiO}_2$ ), aluminum oxide ( $\text{Al}_2\text{O}_3$ ), and ferric oxide ( $\text{Fe}_2\text{O}_3$ ). Because of its unique composition, use as a raw material in cement production is anticipated to be a promising application for LASH. LASH has the potential for replacing the shale component of the cement kiln feed and also for acting as a partial source of calcium. An assessment of the shale replacement application will be made by comparing the composition of the target material with that of LASH. Additionally, the quantity and composition of the raw materials presently in use, location of sources relative to the cement kiln, analysis of cement products currently being produced, and lime to be used by the gasifier in comparison to the LASH generated will also be evaluated. Kiln feed raw material blends involving LASH will be estimated to replicate the existing cement products; potential problems with alkali elements or sulfur and the impacts of LASH variability, as a function of variability in coal quality, will be assessed. An additional consideration in the economics of using LASH in this application is that its transportation could be combined with the supply of limestone for the gasifier operation if the limestone is supplied from the same nearby source that supplies the cement manufacturer.

The use of aggregates or materials for engineering structural fill and construction of embankments requires measurement of slope stability and bearing capacity. Tests that will provide the data are ASTM D-1557 (Maximum Dry Density and Optimum Moisture Content); ASTM D-2435 (Consolidation Tests); and ASTM D-3080 (Direct Shear Tests). These tests will be conducted, using simulated LASH, as required to determine its potential as a granular backfill material and compared with a conventionally used and locally available material.

Use of LASH as a road construction aggregate will require measurement of its load-bearing capacity and resistance to shearing forces, in addition to testing for physical and engineering characteristics. Two California Department of Transportation tests, which have gained national recognition for measuring these properties, are: "R" Value (Caltran Test 301) and the California Bearing

Ratio (CBR—Caltran Test 321). These tests will be performed on simulated LASH samples in accordance with specified test procedures.

Cement and asphalt concrete aggregates are examples of medium-volume applications that require more exacting material specifications and command higher unit prices. These medium-volume applications can provide an important utilization strategy because of the higher unit prices. Coal ash, being a siliceous material, can have a relatively high concentration of alkali elements compared to naturally occurring aggregates. This, along with the presence of lime in the LASH, indicates that tests for adverse aggregate reactions should be conducted. Therefore, the potential for LASH silica-alkali reactivity will be evaluated as part of the initial test program to ensure that the concrete will be durable and will not have long-term volume expansion reactions (ASTM C-289, Potential Reactivity of Aggregates). Although this test does not provide a guaranteed negative conclusion, failure indicates that extensive evaluation of concretes made with LASH for volumetric change will be required to prove that it is an acceptable aggregate for concrete. Use of LASH in cement concrete applications could be advantageous provided that the available lime can be used effectively to reduce the cement requirements of the mix. Therefore, cement concrete mixes incorporating LASH will be prepared to make test specimens for compression tests (ASTM C-192). Comparison of the results of the compression tests with the control sample using a conventional aggregate will provide an indication of the suitability of LASH as a cement concrete aggregate.

Flowable backfill is a relatively new approach to engineering backfill applications that is rapidly gaining favor with contractors because of reduced time requirements and lower labor costs for fill projects. Flowable backfill is a self-leveling slurry typically made of cement, aggregates, fly ash, or other pozzolans and water that develops sufficient strength in 24 hours to achieve the bearing capacity of equivalent compacted backfill methods. The ultimate strength of flowable fill can be controlled, depending on the application. If future work activities require excavation of flowable fill, it is easier to rework since its ultimate strength is typically limited to 300 psi. Mix designs for flowable fill are highly variable and are usually dictated by economics.

It is possible that LASH can be used as a substitute for fine aggregates in concrete mixes designed to produce concrete with compressive strength of 2,000 psi. Following the procedures in ASTM C-192 (Method of Making and Curing Concrete Test Specimens), LASH specimens will be cast, then tested according to ASTM C-109 (Test Method for Compressive Strength of Hydraulic Cement Mortars) to determine unconfined compressive strength. LASH will be blended with other aggregates in conformance

with ASTM C-33 (Specification for Concrete Aggregates) and ASTM C-144 (Specification for Aggregate for Masonry Mortar). The pozzolanic properties of the LASH specimens will be evaluated by adapting ASTM C-593 (Standard Specification for Fly Ash and Other Pozzolans for Use with Lime).

The purpose of soil stabilization or soil modification is to improve certain soil characteristics that enable the subgrade to provide adequate strength or support for the pavement, or simply to expedite construction in areas where undesirable soil characteristics make construction activities difficult. Potential benefits may include reducing plasticity, modifying the soil texture, and decreasing volumetric shrinkage. The ultimate benefit would be to improve the load-carrying capacity of the subgrade. Use of LASH in soil stabilization applications will be evaluated in accordance with soil-cement testing guidelines published by the Portland Cement Association (PCA). The maximum dry density and optimum moisture content of the blend will be determined according to ASTM D-1557; the unconfined compression strength will be tested in accordance with ASTM D-1633 (Compressive Strength of Molded Soil-Cement).

Toxicity Characteristic Leaching Procedure (TCLP) test data associated with RCRA have been required by Washoe County before the material can be landfilled. Data on the TCLP leachate characteristics of the LASH will be generated and evaluated to determine if the LASH exhibits the characteristic of toxicity. In such a situation, the LASH would be handled as a hazardous waste. Should the TCLP test data indicate the LASH is not toxic, the data generated will be further evaluated to identify improved safe disposal options for LASH. These evaluations will include:

- Methods of achieving reduced (improved) permeability;
- Reducing lime reactivity; and
- Improving compacting density to reduce landfill volume and permeability.

Use of LASH as a landfill day cover also will be investigated.

#### ***4.3.3 Summary of Mitigation Measures Considered Necessary***

*The mitigation measures summarized in Table 4.3.3-1 are considered necessary to minimize the impacts that would be associated with the proposed project. Page references have been provided where additional discussions are presented.*

Table 4.3.3-1. Mitigation measures for impacts associated with the proposed Piñon Pine Power Project.

Section	Page	Mitigation Measures
4.1.1	4-4	<p>Trees (cottonwoods, poplars, and alders, etc.) would be planted on the south bank of the Truckee River to screen portions of the proposed facility. At maturation, the trees would provide screening for the lower 9-12 meters (30-40 feet) of the project.</p> <p>Where possible, portions of the proposed Piñon Pine Power Project would be painted in earth-tones, except for highlighting colors (yellow and red) needed for health or safety reasons. Structural steel would be silver/grey color to blend in with existing facilities.</p>
4.1.2.2	4-24	Fugitive dust emissions would be minimized during construction by water application as necessary.
	4-26	SPPCo. would continue to work with the NDOT to improve travel safety during fog events. SPPCo. proposes to count the number of baseline fog days. Warning signs currently posted on I-80 are consistent with mitigation used in other areas prone to occasional fog.
4.1.3	4-36	A geotechnical report would be prepared. Mitigating measures (such as excavating and removing loose to medium density materials) would be implemented if: soils are found liquefiable; soils are found to be collapsible, or settlements are found to exceed tolerable settlement values.
	4-43	<i>A soil resistivity program would be implemented and used in the design of underground features.</i>
4.1.6.1	4-61	SPPCo. would periodically test the evaporation ponds. If water quality is found to be <i>hazardous to wildlife</i> , SPPCo. would either neutralize the ponds' contents or work with NDOH to develop the necessary exclusion measures.
4.1.6.2	4-66	Habitat enhancement for Mule deer would be facilitated by planting food source plants to act as an attractant.
4.1.7.1	4-68	Archaeological site 26-St-192 would be protected by a permanent 6-foot chain-link fence. A temporary chain link fence would be constructed between the railroad line and sites 26-St-194, -195, -196, and -197.
4.1.11	4-98	The temporary (1- to 2-week period) and short-duration (about 2½ minutes each) steam blowing activity would produce audible, and potentially disruptive, levels of noise. Prior to the initiation of steam blowing, letters of explanation would be sent to the nine residences in the area to avert the potential concern that a problem may exist at the power plant. Because high noise levels at night would likely cause sleep interference at the nearest residence, SPPCo. would mitigate the impact by temporarily relocating, on a voluntary basis, the affected residents to a hotel in the Reno/Sparks area. This impact, and mitigating measure, would take place only during the construction phase.

## **5. IMPACTS OF COMMERCIAL OPERATION**

Commercial operation of the proposed Piñon Pine Power Project would probably occur immediately after the completion of the 3½-year demonstration and testing period. Two scenarios are reasonably foreseeable outcomes of the demonstration and are considered in this chapter: (1) a successful demonstration followed by continuation of the project at approximately the same power level using the same facility with IGCC technology; and (2) an unsuccessful demonstration followed by SPPCo. operating the plant using natural gas as the primary fuel with coal storage and processing operations being shut down.

### **5.1 Successful Demonstration**

The proposed coal gasification combined-cycle power generation technology is expected to provide a uniquely efficient and cost-effective means for producing electric power from coal in a manner that meets present and future environmental requirements and is as safe or safer than alternative coal-fueled technologies. The Piñon Pine Power Project technology should meet or surpass current environmental, health, and safety regulatory requirements. Based on the experience gained from demonstration of this project, future commercial plans can be optimized to meet future site-specific statutes and regulations.

The IGCC technology based on the KRW fluidized-bed coal gasification process with hot gas cleanup is qualified to meet commercial market criteria of the 1990's and beyond. It should provide the following:

- An economically and environmentally superior option to a pulverized coal-fired boiler with "Best Available Control Technology";
- Internal and external controls to reduce waste products and improve efficiency; and
- Environmental and economic attributes that should expedite the permit process required by environmental, safety, and socioeconomic statutes and regulations.

If the demonstration is successful, SPPCo. would continue commercial operation using the demonstrated technology. The proposed 104 MW gross capacity would assist SPPCo. in achieving base load generation in the late 1990s. The proposed technology utilizes a combined-cycle that is considered inherently more efficient than any other commercially feasible power cycle. Additionally, if successful, operation with the new technology would be environmentally beneficial because emissions would be significantly lower than from other base-load coal-fired options. Impacts of commercial operation would be similar to those contained in Chapter 4, Environmental Consequences, for the following areas:

- Setting;
- Geology and soils;
- Land use;
- Biological resources/biodiversity;
- Cultural resources; and
- Socioeconomic resources.

Because this is a demonstration project, various options (e.g., coal types) would be tested. Consequently, the most effective and efficient processes and materials ultimately would be utilized, resulting in a reduction of any adverse impacts associated with water resources, air quality, and solid and hazardous waste generation and disposal.

*If successful, it is believed that the anticipated ability of the Piñon Pine Power Project to produce low NO<sub>x</sub> emissions, to capture a high percentage of the sulfur in the coal and, by means of its high-efficiency, to reduce the amount of greenhouse gases (e.g., carbon dioxide) produced per kW of electricity will ensure its position as a leading technology for compliance with requirements of the Clean Air Act. The anticipated emission levels would be lower than could be achieved from any currently available commercial pollution prevention technology.*

## 5.2 Unsuccessful Demonstration

The proposed Piñon Pine Power Project would allow for the flexible use of different fuels including natural gas, propane, and coal; therefore, should the clean coal technology demonstration fail, it is unlikely that the facility would remain idle. One reason the technology was selected was to give SPPCo. the ability to use the fuel that is the most economically efficient and environmentally protective throughout the plant's life. If coal proved to be an unsuccessful alternative, SPPCo. would probably

consider using natural gas with distillate oil as a secondary fuel source. This scenario would mirror the project that is presently considered SPPCo.'s most reasonable course of action if DOE does not provide cost-shared funding support (see section 2.2.2, No-action Alternative).

Operation of the KRW gasifier would be terminated along with utilization of the cyclone unit and hot gas cleanup section. As described in section 2.1.2, the proposed combustion turbine would have the capability to operate utilizing both natural gas and distillate oil. Coal storage and processing facilities would no longer be operational.

If the proposed action were unsuccessful and operation were switched over to natural gas, future environmental impacts would be slightly reduced. The use of natural gas would result in lower air emissions including SO<sub>2</sub>, NO<sub>x</sub>, PM<sub>10</sub>, CO, and CO<sub>2</sub>. The plant would continue to operate in compliance with NAAQS standards and PSD program requirements. Ambient air concentrations in the nonattainment areas for CO, O<sub>3</sub>, and PM<sub>10</sub> would not be significantly impacted. There also would be a decrease in water consumption rates; any water conservation methods adopted would continue to take place. An end to coal handling operations would result in a reduction in solid waste through the termination of LASH production. In addition, fugitive dust tied to coal particles would be eliminated.

The availability of natural gas to Tracy Power Station is uncertain. The one pipeline that would service the plant because of its location, (owned by the Paiute and Southwest Gas companies) historically has been used to peak capacity during the winter months. If this continues, an adequate supply of natural gas for power production at the Tracy Station site would not be available and the use of a secondary fuel would be required. However, if the proposed Tuscarora pipeline is constructed, natural gas could potentially be used exclusively. The pipeline would end at the property line of the Tracy Power Station SPPCo. would be responsible for extending the pipeline no more than 15 meters (50 feet) for use by the natural gas-fueled plant. The Federal Energy Regulatory Commission (FERC) is in the process of preparing an EIS for the Tuscarora pipeline. It is not connected to the proposed Piñon Pine Power Project; the decision to proceed with the Tuscarora pipeline is independent of the decision on the proposed action.

## 6. CUMULATIVE IMPACTS

### 6.0 Summary of Changes Since the DEIS

*The only change in this chapter is an update of the status of the Honey Lake project.*

A cumulative impact is defined as the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). This chapter discusses potential impacts resulting from other facilities, operations, and activities that in combination with potential impacts from the proposed Piñon Pine Power Project may contribute to cumulative impacts. Future actions, proposals, or plans are discussed where implementation appears to be possible within a 3-5 year time frame.

The proposed action would take place within the Truckee River watershed, which is a resource of primary concern in this FEIS. Although concerns related to the availability and quality of water are not uncommon in the western United States, proposed developments that use and/or discharge water must be considered within the context of downstream users, existing availability, future demand, and the legal holders of water rights. The heavy use of water for agriculture and mining purposes has resulted in water consumption allocation through laws and regulations. Today, all consumers of water along the Truckee River have allocations and rights that are defined through legal instruments. Although this has not lessened the debate over who should have water and how much, resources of concern (e.g., fisheries) and critical users are protected. Entities proposing development, including residential and commercial uses, must secure the necessary water rights before building permits will be issued. Within the immediate vicinity of the proposed action  $\pm 32$  km ( $\pm 20$  miles), no major developments within the watershed are planned. The Storey County Master Plan (1993) identifies the area south of the Truckee River and adjacent to the project site as having the potential to support industrial development, but no measures have been taken (e.g., speculative construction, development of industrial infrastructure) to indicate that the area would be industrially developed in the near-term.

Several utility projects have been identified that could impact the Truckee River watershed. The Tuscarora gas transmission project sponsored by Sierra Pacific Resources and TransCanada Pipelines

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Limited will consist of 369 km (229 miles) of 51-cm diameter underground steel pipeline constructed from southern Oregon to the Tracy Power Station. The pipeline will be buried in 0.9 meters (3 feet) of soil and 0.6 meters (2 feet) of bedrock, and deliver 3.1 million cubic meters of natural gas by the fall of 1995. Areas of concern related to the project are the ground subsidence and fracturing that occurs near the Amedee Geothermal Project, especially as it approaches the Southern Pacific Railroad and the Honey Lake project (see the discussion that follows), because the proposed gas pipeline route overlaps areas of predicted subsidence. Concerns for impacts of the Tuscarora gas line on the Truckee watershed are based primarily on whether or not leaking or cracking would occur. ✓

In addition, another proposed utility construction, the Alturas 345 kV Transmission Line Project, will connect Sierra's transmission system to utility systems in the Pacific Northwest. Approximately 257 km (160 miles) of line between Reno and Alturas will allow northern Nevada to tap into economical energy sources. Plans are being made to upgrade interties between SPPCo. and Pacific Gas and Electric (PG&E). Right of way widening for the 60 kV to 120 kV upgrade will most likely occur within the existing easement. No additional tree removal or blading would be necessary. Best Management Practices will be utilized during construction to minimize impacts. Any impacts to the watershed should be slight.

Casino development and gaming industry expansion may have an impact on the water quality and quantity in the Truckee Region. In 1992, approximately 11 percent of SPPCo. sales, or 652,774 MWh, was attributed to the casino/gaming/hotel sector. The annual load rate is expected to increase 2.8 percent from 1993 through 1997. Several proposed projects are planned in the Reno/Sparks area including 2 new hotel and casino developments; expansion of 6 hotel, restaurant, and casino establishments; and a new 80 lane bowling facility. During construction, these projects will likely increase sediment loads to the Truckee river because of their proximity to the river. As mentioned, water rights must be secured prior to construction. Uncertainty exists over the exact number of large-scale developments, such as the casinos, that would take place in the foreseeable future.

The 113 million dollar Honey Lake project, a joint partnership between Western Water Development Co., and Washoe County would deliver 13,000 acre-feet of water from the Honey Lake Basin north of Reno for new homes in Spanish Springs and Lemmon Valley. The project would potentially supply sufficient water volume to this area for 20 years. However, there is much controversy surrounding this project. The Pyramid Lake Paiute Indian Tribe has opposed the pipeline project on the grounds that it would lower the water table in Pyramid Lake Valley and Smoke Creek Desert, and

potentially impact the Cui-ui fish. In addition, EPA has objected to the project because it could potentially have an adverse impact on over 250 acres of wetlands, 13,000 acres of greasewood, and could increase dust pollution in the Honey Lake Valley. EPA also has opposed this project because of the groundwater contamination problems at the Herlong Army Depot. The Draft EIS for the Honey Lake project was published in May 1993; *however, work on the Final EIS has stopped*. It is uncertain at the time of this writing if the Honey Lake project is a viable project.

Aggregate mining within the area has the potential to degrade water quality and water quantity by increasing sediment loads and adding chemicals. Mining, however, generally occurs in Elko, Eureka, Humboldt, and Lander Counties; locations in excess of 161 km (100 miles) from the proposed Piñon Pine Power Project site.

The Truckee River is potentially threatened from a multimillion-gallon fuel spill within the city limits of Sparks. A banana-shaped underground fuel plume, estimated at 4 million gallons, is seeping from a Sparks tank farm underneath I-80 and the Helms Pit. Pumping from the pit has protected the plume from spreading into the Truckee River. EPA is actively involved in analyzing the extent of the problem, as well as holding hearings to determine liability.

Other activities and land uses within the Truckee River system that may contribute to cumulative impacts include the operation of a landfill in Placer County, CA; a closed landfill in Nevada County, CA (both within 1.6 km (1 mile) of the Truckee River main stem); and the Lockwood solid waste facility east of Sparks.

Although the projects cited have the potential to further draw-down water levels in the Truckee River, water restrictions currently in place would minimize the cumulative impact of the proposed action and these projects on the river. Other users that are upstream of the proposed action have the potential to degrade water quality as a result of urban runoff, sedimentation, and groundwater impacts. The proposed action would not exacerbate these conditions and, thus, would not have a cumulative adverse impact on the river.

The cumulative impacts from the proposed and other known projects on Pyramid Lake water levels on the endangered Cui-ui fish and the threatened Lahontan cutthroat trout would not be adverse under conformance to the Orr Ditch Decree and the Cui-ui Recovery Plan. The Orr Ditch Decree and

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the subsequent Truckee-Carson-Pyramid Lake Settlement Act of 1990 promote efficient use of the water, while the Recovery Plan will increase spawning flows, decrease water temperatures, improve water quality, and provide a more suitable habitat. More information on the Cui-ui can be found in sections 4.1.6.3 and 4.1.7.2 regarding the environmental consequences to the Cui-ui and in the Biological Assessment for the Cui-ui, Lahontan Cutthroat Trout, and Bald Eagle, available in the reading rooms, which are listed in Appendix H.

The above mentioned projects would not be considered major sources in terms of air pollution, nor would they contribute significantly to air degradation in the area. Cumulative impacts on regional air quality, including in the Class I area, the Desolation Wilderness Area, are expected to be slight. For a more in-depth analysis of regional air quality issues, see the Air Quality Technical Report, available in the reading rooms listed in Appendix H.

## **7. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY**

The construction and operation of the proposed Piñon Pine Power Project would have an impact on the environment for at least as long as the plant is in operation and the land taken for the project (plant and auxiliary facilities) would be lost from current uses during the period that the land is used as a power plant.

The proposed plant would be consistent with Federal, regional, and state of Nevada plans. These plans are based on planning efforts that recognize the need for orderly growth and power service demands within the context of past, present, and future development. The short-term impacts and use of resources for the proposed plant also would be consistent with the maintenance and enhancement of long-term productivity for northern Nevada and the SPPCo. service area.

## **8. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION**

Implementation of the proposed Piñon Pine Power Project would involve a commitment of natural, physical, human, and fiscal resources. Land used in the construction of the proposed facility would be considered an irreversible commitment during the time period that the land is used as a power plant. However, if greater need arises for the use of the land or if the plant is no longer needed, the land could be converted to another use. At present, there is no reason to believe such a conversion would be necessary or desirable.

Considerable amounts of fossil fuel, labor, and construction materials such as cement, concrete and steel would be expended. Additionally, large amounts of labor and natural resources would be used in the fabrication and preparation of construction materials. These materials are generally not retrievable. However, with the exception of water, none of these resources are in short supply, therefore, their use would not have an adverse effect. The irretrievable utilization of water would not be significant and would conform to the water rights allocated to the project. Efforts to conserve water have been incorporated into the design and operation of this project. Construction also would require a substantial one-time expenditure of Federal funds as part of the Clean Coal Technology Demonstration Program, which are retrievable by a repayment plan based on future licensing and commercialization of the demonstrated technologies.

The commitment of these resources is based on the concept that businesses, residents of the service area, commercial users of power, and the Federal government would benefit from the improved quality of service associated with the new plant. These benefits would consist of improved service to meet existing and proposed demands, the results of the demonstration phase for burning coal cleanly, and a greater availability of quality services, which are anticipated to justify the commitment of these resources.

## **9. REGULATORY COMPLIANCE AND PERMIT REQUIREMENTS**

### ***9.0 Summary of Changes Since the DEIS***

*Updated information and additional information in response to public comments have been incorporated into this chapter.*

This chapter discusses Federal and state regulatory compliance and permit requirements for the proposed Piñon Pine Power Project. It is important to distinguish between NEPA and permitting requirements. NEPA is not a permitting process but it involves examining perceived or potential environmental impacts. Conversely, environmental laws such as the Clean Air Act (CAA), the Clean Water Act (CWA), and the Resource Conservation and Recovery Act (RCRA) require proponents of proposed actions to make application to appropriate Federal, state, and local agencies. Construction and operation of the proposed project would be in compliance with environmental health and safety regulations and permit conditions.

The required environmental permits for the proposed project are listed in Table 9-1. This list was developed through coordination with permitting agencies. Communication with regulatory officials to discuss refinements or changes in design and in regulatory requirements will continue. Anticipated compliance monitoring activities are presented in Table 9-2. The following sections provide a narrative discussion of specific regulatory requirements.

### **9.1 Setting Requirements**

There are no specific policies or guidelines regarding aesthetic resources in Storey County.

### **9.2 Atmospheric Conditions Requirements**

The proposed project would be constructed and operated in compliance with the CAA and the Nevada Air Pollution Control Law to ensure that air quality is maintained. The CAA provides the foundation for regulating emissions of air pollutants into the environment. Section 445.6605 of the Nevada Revised Statutes (NRS) adopts by reference 40 CFR 51.100(hh) to 51.100(kk), inclusive;

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**Table 9-1. Applicable environmental permits, proposed Piñon Pine Power Project.**

Permit	Permitting Authority	Legal basis	Regulations	Activity requiring permit
<b>Air</b>				
PSD Permit/ Permit to Construct	NDEP	Clean Air Act NRS 445.473	40 CFR 52.21 et seq. 40 CFR Part 50	Construction and operation of a major source of atmospheric emissions in an attainment area
Compliance Plan Amendments	NDEP/EPA	Clean Air Act	40 CFR Part 72	Control requirements, monitoring, and SO <sub>2</sub> allowances
Monitoring Plan Approval	EPA/NDEP	Clean Air Act	40 CFR Part 75	Emission monitoring for acid rain
<b>Water</b>				
State Discharge Permit Program	NDEP	Clean Water Act NRS 445.221	NAC 445.140	Construction and operation of a new or expanded evaporation pond
Non-Community Water Supply Permit	NDEP	Safe Drinking Water Act		Construction and operation of potable water system
Stormwater Permit	NDEP	Clean Water Act	40 CFR Part 122	Construction activity resulting in more than 5 acres of soil disturbance where a potential for discharge to waters of the United States exists
<b>Transportation</b>				
Notification of Construction in Navigable Airspace	FAA	Federal Aviation Act	14 CFR Part 77	Construction of a structure greater than 200 feet in height
<b>Waste</b>				
Solid Waste	Storey County	RCRA and Solid Waste Management Act	Waste Management Code, Chapter 8.10 and 8.32, County of Storey	Permit for hazardous material usage, hazardous waste treatment/disposal, and solid waste disposal
<b>Miscellaneous</b>				
Special Use Permit	Storey County		Storey County Code 17.36.020D, Ordinance 54, Chapter 1, section SC9:A-1-1972	Continued operation of the Tracy Power Station; construction and operation of the proposed project
Building Permit	Storey County			
Utility Environmental Protection Act Permit	Public Service Commission of Nevada (PSCN)			Construction, operation, and rate-basing.

Table 9-2. Compliance monitoring.

Monitoring Activity	Anticipated Monitoring	Monitoring Category
Gas Turbine	Sulfur/nitrogen content of fuel	Compliance, daily or as received
	Continuous SO <sub>2</sub> , NO <sub>x</sub> , CO <sub>2</sub> , and O <sub>2</sub> , opacity, and flue gas volumetric flowrate	Compliance, continuous
Coal Processing	Opacity	Compliance, continuous or EPA method 9
	Coal dryer exhaust gas temperature	Compliance, continuous
Groundwater	Monitoring wells at evaporation pond for iron, copper, TDS, pH, and TCLP metals Monitoring wells of cooling pond for iron, copper, TDS, pH	Compliance, periodic samples
Industrial Hygiene	Particulates, metals, and noise	Compliance, periodic samples
	CO and H <sub>2</sub> S	Compliance, periodic samples
	Regulated hydrocarbons	Compliance, periodic samples
	Unregulated hydrocarbons	Compliance, periodic samples
	Fugitive emissions	Compliance, periodic samples
Hazardous Waste	Hazardous constituents/characteristics	Compliance, periodic samples

51.100(n), 52.21 (Prevention of Significant Deterioration — PSD regulations); 40 CFR Part 60 (New Source Performance Standards — NSPS) and 40 CFR Part 61 (National Emission Standards for Hazardous Air Pollutants — NESHAP). The regulatory review for the proposed Piñon Pine Power Project would be performed by the Nevada Department of Conservation and Natural Resources, Division of Environmental Protection (NDEP).

The CAA Amendments of 1970 established ambient ceilings for certain criteria pollutants based upon the latest scientific information regarding all identifiable effects a pollutant may have on public health or welfare. EPA has promulgated National Ambient Air Quality Standards (NAAQS-40 CFR Part 50) for sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), particulate matter (PM<sub>10</sub>), nitrogen dioxide (NO<sub>2</sub>), photochemical oxidants (O<sub>3</sub>), and lead (Pb). These regulations establish two classes of standards that must be achieved. Primary standards establish ambient concentration levels above which public health is believed to be threatened. Secondary standards set concentration levels above which the environment, (e.g., crops, livestock, wildlife), is considered to be negatively affected. Table 9.2-1 presents both state and Federal air quality standards (hydrogen sulfide (H<sub>2</sub>S) and visibility requirements apply only to Nevada).

Table 9.2-1. State and Federal ambient air quality standards.

Pollutant	Averaging Time	Nevada Standards ( $\mu\text{g}/\text{m}^3$ )	National Standards*	
			Primary ( $\mu\text{g}/\text{m}^3$ )	Secondary ( $\mu\text{g}/\text{m}^3$ )
PM <sub>10</sub>	24-Hour	150	150	150
	Annual Arithmetic Mean	50	50	50
SO <sub>2</sub>	3-Hour	1,300	None	1,300
	24-Hour	365	365	365
	Annual Arithmetic Mean	80	80	80
NO <sub>2</sub>	Annual Arithmetic Mean	100	100	100
CO	1-Hour	40,000	40,000	40,000
	8-Hour	10,000	10,000	10,000
O <sub>3</sub>	1-Hour	235	235	235
H <sub>2</sub> S	1-Hour	112	NA	NA
Visibility	Observation	Insufficient amount to reduce visibility to less than 30 miles when humidity is less than 30%	NA	
Pb	Calendar Quarter	1.5	1.5	1.5

\*These standards, other than for ozone and those based on annual averages, must not be exceeded more than once per year. The ozone standard is attained when the expected number of days per calendar year with a maximum hourly average concentration above the standard is equal to or less than one.

The PSD requirements are contained in 40 CFR Part 52. Under these regulations, all major new or modified existing sources of air pollutants located in attainment areas and regulated under the CAA must be reviewed and approved by the U.S. Environmental Protection Agency (EPA) or a delegated

administrator. PSD review authority has been delegated to NDEP by the EPA for sources located in all Nevada counties, except Clark and Washoe.

Under Federal New Source Review (NSR) policy, the proposed Piñon Pine Power Project is defined as a modification of an existing source because it would be located on property contiguous to existing Tracy Station facilities. A modification is classified as "major" if the modification alone would constitute a major source. A "major stationary source" is defined as any of the 28 specified source categories [(40 CFR 52.21, (i))] that has the potential to emit 100 tons per year or more, or any other stationary source that has the potential to emit 250 tons per year or more, of any air pollutant regulated under the CAA. The term "potential to emit" is defined as the capability, at maximum design capacity, to emit a pollutant after the application of control equipment. The proposed Piñon Pine Power Project would be a fossil-fuel fired steam electric plant with more than 250 MMBtu/hr input, one of the 28 specified source categories, and would emit more than 100 tons per year of regulated air pollutants.

The principal air quality protection mechanism under the PSD program involves a system of increments and area classifications that effectively define "significant deterioration" for individual pollutants. The CAA divides PSD areas into three classes and applies increments of different stringency to each class. Class I areas include international parks, national wilderness areas, memorial parks larger than 5,000 acres, and national parks larger than 6,000 acres. Less restrictive increments apply in areas designated as Class II. The Class III area designation allows a state to permit increased air quality deterioration in specific areas that the state targets for higher levels of industrial development and consequent increases in pollution (to date, no state has established a Class III area).

The NDEP is currently reviewing SPPCo.'s PSD permit application. SPPCo. anticipates final approval of the permit to construct by December 1994 (*the PSD application for a permit to construct and its four revisions are available in the public reading rooms listed in Appendix H*). The control technology review requirements of the PSD regulations require that all applicable Federal and state emission limiting standards be met and that Best Available Control Technology (BACT) be applied to control emissions from the source (*see section 4.3.2.1*). PSD regulations also require analyses of the impairment to visibility and the impacts on soils and vegetation that would occur as a result of the proposed source.

The NSPS (40 CFR Part 60) pertain to various types of emission sources defined as affected facilities. The proposed Piñon Pine Power Project has two affected facilities, the combustion turbine (Subpart GG) and the coal preparation area (Subpart Y).

Subpart Y defines particulate matter and opacity standards for coal processing plants. The coal storage, transfer, or processing systems emission standard is expressed as no greater than 20 percent opacity. The proposed project's coal processing system would use fabric filter control systems on *most* exhaust points and is not expected to emit any visible emission. In addition, Subpart Y requires monitoring of coal thermal dryer exhaust gas temperature, monitored to within -16°C (3°F) annual calibrations of the monitoring system, and performance testing of the coal dryer for particulate matter and opacity (using EPA reference methods 1, 2, 3, 4, 5 and 9) is required. Subpart GG defines oxides of nitrogen (NO<sub>x</sub>) and SO<sub>2</sub> emission standards for stationary combustion turbines and also contains monitoring and testing requirements. Subpart GG also requires emission testing for NO<sub>x</sub> and SO<sub>2</sub> to determine compliance with emission standards (using EPA reference method 20). All sources subject to NSPS also are subject to the general provisions of NSPS (Subpart A).

The proposed Piñon Pine Power Project would also be subject to the acid rain provisions of the Clean Air Act Amendments of 1990 (CAA Amendments of 1990) and would be required to install and operate a continuous emission monitoring (CEM) system for SO<sub>2</sub>, NO<sub>x</sub>, oxygen (O<sub>2</sub>), or carbon dioxide (CO<sub>2</sub>), opacity, and volumetric flow rate. These monitoring requirements exceed the emission testing requirements contained in Subpart GG.

Other significant amendments were enacted in the CAA Amendments of 1990. The precise impact of these amendments upon the proposed Piñon Pine Power Project cannot be stated with certainty at this time because regulations as yet unpromulgated by the EPA will eventually define the impact levels. However, Title V establishes a new permitting structure that requires all major sources of air pollution to obtain a permit pursuant to the new requirements of the title. Title V requires EPA to promulgate regulations that define the requirements for state programs to implement the title. Each state then will have 3 years to develop and submit to EPA a new operating permit program for compliance. NDEP submitted a proposed Title V permit program in November 1993.

Title III of the CAA Amendments of 1990 mandates specific studies to establish if public health criteria warrant further control of utility emissions of hazardous air pollutants. Title IV imposes additional constraints on utility emissions of SO<sub>2</sub> and NO<sub>x</sub> to alleviate acidic deposition. Nationwide SO<sub>2</sub>

emissions will be reduced in two phases by a total of 10 million tons below 1985 levels; 5 million tons by 1995, and another 5 million tons by 2000. A 4-year extension of the second-phase will be granted to power plants that utilize clean coal technologies to decrease their emissions. NO<sub>x</sub> emissions in the year 2000 are required to be 2 million tons less than 1980 levels.

The CAA Amendments of 1990 requires Federal actions to conform with any State Implementation Plan (SIP). An SIP provides for the implementation, maintenance, and enforcement of NAAQS for criteria pollutants [i.e., sulfur dioxide (SO<sub>2</sub>), particulate matter (PM<sub>10</sub>), carbon monoxide (CO), ozone (O<sub>3</sub>), nitrogen dioxide (NO<sub>2</sub>), and lead (Pb)]. Its purpose is to eliminate or reduce the severity and number of violations of NAAQS and to achieve the expeditious attainment of such standards. The final rule for "Determining Conformity of General Federal Actions to State or Federal Implementation Plans" was promulgated by EPA on November 30, 1993 (58 FR 63214), and became effective on January 31, 1994 (40 CFR Parts 6, 51, and 93). EPA has, for now, limited the applicability to only those areas classified as nonattainment, or classified after 1990 as maintenance areas. The proposed project site is located in the Tracy Segment (Subbasin 83) of the Truckee River Basin. The air quality in this area is designated as "unclassified". Unclassified areas are treated in the same manner as attainment areas. Thus, the proposed Piñon Pine Power Project site is classified as being in an attainment area. In addition, the area has not been classified as a maintenance area. Hence, the provisions of this rule do not apply to the proposed site. (In addition, were the proposed project to be in a nonattainment area or applicable maintenance area, any portions of this action that would require a permit under New Source Review (NSR), or the PSD, requirements of the CAA still would not require a conformity determination.) Consequently, no action relating to a conformity determination for the proposed Piñon Pine Power Project site is required, and none has been undertaken.

Nevada Administrative Code (NAC) section 445.709 requires applicants of any source that has the potential to emit an air contaminant to prepare and submit an environmental evaluation to the NDEP. This environmental evaluation must include the applicant's name and address, a project description, a project location map, proposed building dimensions, and topography of the proposed project area. The emphasis of the environmental evaluation is on potential air quality impacts of the proposed project and requires a review of alternative project sites, air dispersion modeling, evaluation of meteorological conditions, and air pollutant emission predictions. This analysis was included in the permit application submitted to NDEP in August 1993.

### 9.3 Geology Requirements

Because of the potential for seismic activity in the region, the proposed facility would be designed in accordance with Seismic Zone 4 requirements of the Uniform Building Code (the most current edition in effect at the time of design). The seismic design of the most critical elements would be evaluated by a structural engineer.

### 9.4 Water Resources Requirements

In 1990, the U.S. Congress enacted Public Law 101-618, the Truckee-Carson-Pyramid Lake Water Rights Settlement Act (the "Settlement Act"). The Settlement Act authorizes an Operating Agreement on the Truckee River among California, Nevada, and the United States, and reaffirms the water rights secured by the Orr Ditch Decree. An Environmental Impact Statement (EIS) currently is being prepared by the Bureau of Reclamation for the Operating Agreement.

#### 9.4.1 Wastewater

Wastewater or process water discharges to groundwater and surface water resources, as well as construction and operation of treatment works, are subject to both Federal and state permitting regulations. The NDEP administers the discharge permit programs. Construction activities that result in the grading, excavation, or clearing of vegetation on a site of 5 acres or greater, where a discharge to waters of the United States or its tributaries may occur, are subject to the application regulations for stormwater discharges associated with industrial activity.

The existing cooling pond and evaporation pond *currently* are not covered by water quality permits because construction preceded the adoption of applicable regulations. *However, it is expected that the state will require SPPCo. to obtain groundwater discharge permits for the ponds.* The proposed new evaporation pond would be regulated under the State Discharge Permit System, which is intended to protect groundwater quality. If sediment is removed from the evaporation ponds, it must be analyzed prior to disposal to determine if any hazardous waste characteristics are exhibited. If the sediment is determined to be hazardous, it would be transported and disposed in accordance with Subtitle C of the RCRA. If the sediment is not hazardous, it would be disposed as solid waste at the Lockwood disposal

facility in accordance with state and local environmental regulations. A National Pollution Discharge Elimination System (NPDES) permit would not be required for the existing or proposed project.

Monitored cooling pond parameters include those organic and inorganic constituents regulated under the Safe Drinking Water Act (SDWA), which may be present in stormwater discharges considering potential pollutant sources. The methods of sample analysis conform to EPA analytical methods found in 40 CFR Part 41.

#### **9.4.2 Spill Prevention**

In compliance with CWA requirements contained in 40 CFR Part 112, an Oil Spill Prevention, Control, and Countermeasures Plan has been prepared for the Tracy Power Station. This plan would be updated when the inventory of oil-filled equipment of storage tanks changes as a result of the proposed project.

#### **9.4.3 Septic System**

Permit applications must be submitted to the Nevada State Health Division *if the tank size is less than 5,000 gallons and to the NDEP if the size is greater than 5,000 gallons.*

#### **9.4.4 Floodplains and Wetlands**

Construction within a floodplain or floodway is regulated by Storey County Code of Ordinances in Chapter 15.20, Flood Damage Prevention. Encroachments of new structures, including fill, is prohibited in floodways unless a registered professional engineer certifies that the encroachment will not result in any increase in flood levels during the base flood event. The cumulative effect of proposed development within the floodplain must not increase the water surface elevation of the base flood more than 0.3 meter (one foot) at any point. General and specific standards related to design and construction methods based on accepted engineering practices are cited in this ordinance. A development permit must be obtained from Storey County if new or additional temporary or permanent development or construction in the floodplain is necessary. DOE regulation 10 CFR Part 1022 requires that a floodplain determination be made using Flood Insurance Rate Maps, or Flood Hazard Boundary Maps prepared by the Federal Emergency Management Agency (FEMA). A DOE Floodplain Notice, as required in 10 CFR Part 1022, must be prepared for publication in the Federal Register and contain an assessment of impact to the

floodplain if construction is planned. The Floodplain Notice for the proposed Piñon Pine Power Project was incorporated in the Notice of Availability (NOA) published in the Federal Register for the DEIS.

Temporary or permanent disturbance of a jurisdictional wetland is regulated by the U.S. Army Corps of Engineers (ACOE) pursuant to Section 404 of the CWA. On-site wetlands were delineated in accordance with the Federal Manual for Identifying and Delineating Jurisdictional Wetlands by the ACOE. If construction activities and proposed development cannot be sited outside wetland areas, coordination must occur with the U.S. Army Corps of Engineers Regulatory-Affairs office in Sacramento, CA, to obtain either a Nationwide Permit or an Individual Permit, depending on the extent of potential disturbance in the delineated wetlands. Permitting requirements are not expected for the proposed action.

#### **9.4.5 Water Quality**

Water quality is governed by both Federal and state laws. Applicable Federal laws include the CWA for surface water and the SDWA for groundwater at locations of community water-supply wells. For some constituents, the Maximum Contaminant Levels (MCLs) under the SDWA are applied as benchmarks for groundwater contamination and as cleanup goals for remediation (under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or the Superfund law), but are not actually enforceable except at a water-supply well. Also, the Resource Conservation and Recovery Act (RCRA) applies to facilities if hazardous wastes are generated.

State requirements are found in the Nevada Water Pollution Control Law (NRS 445.131 through 445.354) and its implementing Nevada Water Pollution Control Regulations (NAC 445.141 through 445.174), which govern point and nonpoint discharges to waters of the state. The Nevada Drinking Water Regulations (NAC 445.244 through 445.262) apply to public drinking water systems and specifically invoke Federal Primary Drinking Water Standards. These regulations also have a two-tiered set of Secondary Drinking Water Standards (see Table 9.4-1); one tier requires a notice to the water users when concentrations are exceeded, and a second tier specifies that selected constituents "must not be present in a public water system..." above the specified level. Nevada Water Quality Standards (NAC 445.117 through 445.13976) govern the water quality in surface waterbodies in Nevada and include a specific table (NAC 445.13468) that details the water quality standards that should be maintained along the reach of the Truckee River between Lockwood Bridge and Derby Dam (see Table 9.4-2).

**Table 9.4-1. Nevada secondary drinking water standards (NAC 445.248).**

Parameter	Notice Level	Exceedence Level
Chloride (mg/L)	250.0	400.0
Color (color units)	15.0	
Copper (mg/L)	1.0	
Foaming Agents (mg/L)	0.5	
Iron (mg/L)	0.3	0.6
Magnesium (mg/L)	125.0	150.0
Manganese (mg/L)	0.05	0.1
Odor (threshold odor number)	3.0	
pH	6.5 - 8.5	
Sulfate (mg/L)	250.0	500.0
Total Dissolved Solids (TDS, mg/L)	500.0	1000.0
Zinc (mg/L)	5.0	

No point source discharges to the Truckee River of either wastewater or stormwater would occur at Tracy Power Station with the proposed project. This condition eliminates any compliance issues with discharge requirements of the CWA, including the need to obtain NPDES permits. This also eliminates the need for compliance with discharge standards for the Steam Electric Power Generating Point Source Category (40 CFR Part 423) under Subchapter N, Effluent Guidelines and Standards.

## 9.5 Land Use Requirements

The proposed project must comply with zoning ordinances and obtain a Special Use Permit for construction and operation.

## 9.6 Biological Resources Requirements

The Fish and Wildlife Coordination Act (FWCA) (U.S. Sect. 661 et seq.) was enacted to ensure that fish and wildlife resources receive consideration during the planning of development projects that affect water resources. The FWCA requires Federal agencies to consult with the USFWS and the state agency administering wildlife resources concerning wildlife protection measures.

Table 9.4-2. Nevada water quality standards: Truckee River at Derby Dam (NAC 445.12468).

Parameter	Units	Requirements to Maintain Existing Higher Quality		Water Quality Standards for Beneficial Uses		Beneficial Uses (most restrictive beneficial use shown in bold)
		Single Value	Annual Average	Single Value	Annual Average	
Temperature	°C	change in temperature = 0 °C at boundary of mixing zone		<u>Maximum temperature:</u> Nov – Mar: $\leq 13^{\circ}\text{C}$ April: $\leq 21^{\circ}\text{C}$ May: $\leq 22^{\circ}\text{C}$ change in temperature $\leq 2^{\circ}\text{C}$		Aquatic life, water contact recreation
pH				7.0 – 8.3 Change in pH $\leq \pm 0.5$		Water contact recreation, wildlife propagation, aquatic life, irrigation, stock watering, municipal or domestic supply, industrial supply
Dissolved Oxygen	mg/L			Nov–Mar $\geq 6.0$ Apr–Oct $\geq 5.0$		Aquatic life, water contact recreation, wildlife propagation, stock watering, municipal or domestic supply, and noncontact recreations
Chlorides	mg/L	$\leq 30$	$\leq 21$	$\leq 250$		Municipal or domestic supply, wildlife propagation, irrigation, stock watering
Phosphates (Total)	mg/L as P				$\leq 0.05$	Aquatic life, water contact recreation, municipal or domestic supply, noncontact recreation
Nitrogen Species	mg/L as N			N (total) $\leq 1.2$ Nitrate $\leq 2.0$ Nitrite $\leq 0.04$ Ammonia $\leq 0.02$	N (total) $\leq 0.75$	Aquatic life, water contact recreation, municipal or domestic supply, noncontact recreation
Total Dissolved Solids (TDS)	mg/L	$\leq 265$	$\leq 215$		$\leq 500$	Municipal or domestic supply, irrigation, stock watering

Table 9.4-2. Nevada water quality standards: Truckee River at Derby Dam (continued) (NAC 445.13468).

Parameter	Units	Requirements to Maintain Existing Higher Quality		Water Quality Standards for Beneficial Uses		Beneficial Uses (most restrictive beneficial use shown in bold)
		Single Value	Annual Average	Single Value	Annual Average	
Turbidity	NTU		≤ 8.0	≤ 10		<b>Aquatic life, municipal or domestic supply</b>
Color	PCU	< 10 PCU increase above natural conditions		≤ 75		<b>Municipal or domestic supply</b>
Alkalinity	mg/L as CaCO <sub>3</sub>			< 25% change from natural conditions		<b>Aquatic life, wildlife propagation</b>
Fecal Coliform	No./100 mL		Geom. mean ≤ 80	≤ 400 for 10% of samples in 30-day period	≤ 200, geometric mean for 30-day period	<b>Water contact recreation, noncontact recreation, municipal or domestic supply, irrigation, wildlife propagation, stock watering</b>
Suspended Solids	mg/L	≤ 40	≤ 24	≤ 50		<b>Aquatic life</b>
Sulfate	mg/L	≤ 46	≤ 39	≤ 250		<b>Municipal or domestic supply</b>
Sodium	SAR	≤ 2.0	≤ 1.5		≤ 8	<b>Irrigation, municipal or domestic supply</b>

NTU = Nephelometric turbidity units.  
PCU = Platinum cobalt units.  
SAR = Sodium adsorption ratio.

Section 3 of the Endangered Species Act (Pub. L. 93-205, as amended) defines an "endangered species" as any species, including subspecies, in "danger of extinction throughout all or a significant portion of its range". The section further defines "threatened species" as any species "likely to become an endangered species within the foreseeable future throughout all or a portion of its range".

Proposed endangered and threatened species are those species for which a proposed regulation has been published in the Federal Register, while candidate species are taxa that the USFWS is considering for listing as endangered or threatened species. Candidate species are divided into two groups. Category 1 candidates are taxa for which the USFWS has substantial information on biological vulnerability and threats to support the appropriateness of proposing listing. Category 2 candidates are taxa for which USFWS information indicates that proposing listing as endangered or threatened may be appropriate; however, substantial data on biological vulnerability and threats are not known or on file to support the immediate preparation of rules. Category 3 taxa constitute species which were previously considered candidates. These candidates are grouped into three subcategories: extinct (3A), taxonomically invalid (3B), or too widespread or not threatened at this time (3C).

Under section 7(c) of the Endangered Species Act, DOE must consult with USFWS to ensure that proposed actions are not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of the critical habit of such species. To satisfy the requirements of section 7(c), a biological assessment was performed to assess the impacts from the proposed project on the Cui-ui, Lahontan cutthroat trout, and bald eagle populations. The opinion of the USFWS pertaining to impacts to endangered and threatened species is provided in Appendix B.

50 CFR Subpart I, section 17.94 requires that an activity or project will not result in the destruction or adverse modification of constituent elements essential to the conservation of listed species within the defined critical habitat. The USFWS determines if the proposed project will in any way impact listed plant or animal species. Appropriate mitigation measures must be developed if necessary.

## **9.7 Cultural Resources Requirements**

Section 106 of the National Historic Preservation Act of 1966, Pub. L. 89-655 as amended (NHPA) requires Federal agencies to take into account the effects of agency undertakings on historic properties, and to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. NHPA established the Council for the purpose of being a major policy advisor to the Federal government in the field of historic preservation. The Council reviews and comments upon Federal and federally assisted and licensed projects that could affect properties listed in or eligible for the National Register of Historic Places. (The National Register is a list of properties in

the United States and its territories that the Secretary of the Interior has determined to have historical, architectural, archaeological, engineering, or cultural significance.)

If a Federal agency determines that its undertakings would not adversely affect historic properties, the agency must obtain the concurrence of the State Historic Preservation Officer (SHPO) and submit its findings with necessary documentation to the Council [36 CFR 800.5(d)]. This documentation must include the views of affected local governments, if available. If an undertaking will have an adverse effect on a historic property, the agency, SHPO, and other interested parties are required to consider ways to avoid or reduce such effects. The opinion of the SHPO pertaining to impacts from the proposed Piñon Pine Power Project is provided in Appendix B.

In addition to the NHPA, existing cultural resource management laws and their implementing regulations address the identification, evaluation, protection, and mitigation of cultural resources affected by proposed government action. The Antiquities Act of 1906 (Pub. L. 89-655) provides for the protection of historic and prehistoric ruins and objects of antiquity on Federal lands; the Archaeological Resources and Historic Preservation Act of 1974 (Pub. L. 93-291) directs Federal agencies to notify the Secretary of the Interior if any Federal construction project or federally licensed activity or program may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archaeological data; and the Archaeological Resources Protection Act of 1979 (Pub. L. 96-95) contains requirements pertaining to increasing public awareness, planning, and scheduling archaeological surveys, and reporting suspected violations.

Special attention has been given to ensure that Indian Tribes and other Native American groups are provided full opportunity to participate in the review of Federal undertakings under section 106. The regulations encourage Federal agencies, SHPOs, and the Council to "be sensitive to the special concerns of Indian tribes in historic preservation issues, which often extend beyond Indian lands to other historic properties [36 CFR 800.1 (c)(2)(iii)]." This includes concerns of a cultural or religious nature, such as the desire to preserve ancestral burial places or sacred sites from desecration, or the desire to maintain access to such places for ritual purposes. The American Indian Religious Freedom Act of 1978 (Pub. L. 95-341) focuses on consultation with Native American tribal and traditional leaders to determine appropriate changes to protect and preserve Native American religious cultural rights and practices. Policies, procedures, and technical actions regarding consultation with Native Americans concerning informational needs are contained in DOE Order 1230.2. The Native American Graves Protection and

Repatriation Act of 1990 (Pub. L. 101-601) was enacted to protect human remains and associated funerary objects and to identify actions to be taken to repatriate Native American cultural items.

## **9.8 Socioeconomic Resources Requirements**

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires Federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations (59 FR 7629, February 16, 1994).

## **9.9 Health and Safety Requirements**

The construction and operation of the proposed Piñon Pine Power Project would be conducted in compliance with standards developed by the Nevada Division of Occupational Safety and Health. These standards parallel health and safety standards promulgated by Occupational Safety and Health Administration (OSHA). The Nevada state standards are, however, more stringent in the areas of asbestos abatement and boilers and pressure vessels.

Although there are no specific OSHA requirements for the protection of workers in gasification plants, guidelines for worker health and safety at coal gasification facilities have been recommended by NIOSH in the following documents:

- "Recommended Health and Safety Guidelines for Coal Gasification Pilot Plants," Department of Health, Education and Welfare (DHEW), National Institute for Occupational Safety and Health (NIOSH) Publication No. 78-120, January 1978; and
- "Criteria for Recommended Standard, Occupational Exposure in Coal Gasification Plants," DHEW (NIOSH) Publication No. 78-191, September 1978.

Hazardous materials used during construction and operation of the proposed project would be handled in full compliance with Nevada regulations regarding the Hazard Communication/Right-To-Know Program. To ensure that employee exposure to these substances does not exceed the standards allowed by OSHA or NIOSH, the SPPCo. Industrial Hygienist would conduct sampling and surveys of the

locations where these chemicals are used. The Chemical Emergency Response Plan would include the requirements of a Spill Prevention, Control and Countermeasures Plan (40 CFR Part 112); a Hazardous Waste Contingency Plan (40 CFR Part 264); a Facility Emergency Evacuation and Fire Fighting Plan (29 CFR Part 38); and a Chemical Emergency Response Plan (29 CFR Part 120).

## 9.10 Hazardous and Toxic Materials/Waste Management Requirements

*Solid waste (e.g., LASH), most likely, would be disposed of at the Lockwood landfill, which operates in full compliance with 40 CFR Part 258, Criteria for Municipal Solid Waste Landfills. These regulations establish minimum national criteria under RCRA for all municipal solid waste landfill (MSWLF) units and under the Clean Water Act for municipal solid waste landfills that are used to dispose of sewage sludge. The regulations include landfill location restrictions; operating criteria; recordkeeping requirements; design criteria; groundwater monitoring, sampling, and analysis requirements; and corrective action implementation requirements.*

Hazardous wastes associated with the operation of the project would be transported and disposed of in accordance with Subtitle C of RCRA. The small quantities of hazardous wastes anticipated include acetone, spent non-halogenated solvents, and waste oil. SPPCo. would analyze the *spent barrier filters from the hot gas cleanup system* to determine if these spent materials qualify as a "Characteristic Hazardous Waste". A Characteristic Hazardous Waste is a solid waste which exhibits any of the following characteristics: (1) ignitability, (2) corrosivity, (3) reactivity, or (4) toxicity. A detailed explanation of each of these characteristics is provided in 40 CFR Part 261, Subpart C.

Hazardous wastes from the project would be transported in accordance with 40 CFR Part 262, Subpart C, and disposed of in full compliance with OSHA Standard 40 CFR 1910.1200 and 10 CFR Part 20. Table 9.10-1 presents a list of Nevada state regulatory requirements governing the storage, handling and transportation of hazardous wastes. The table also includes a reference identifying the Federal basis for the requirement and the maximum penalty that can be imposed by the state for non-compliance. These requirements also relate to the Hazard Communication/Right-To-Know Program. A monitoring program would be conducted for chemical and radiation exposures. Communication and worker training programs as well as protective equipment requirements would be developed as a result of monitoring.

In the event that a radiation source becomes unusable or the permit for its use expires or is revoked, the source would be packaged for shipment in accordance with the requirements of 49 CFR Part

Table 9.10-1. State requirements for storing, handling, and transporting hazardous waste.

State Regulatory Requirement	Code of Federal Regulations Reference	Max. Penalty For Non-Compliance
Determine if solid waste is a hazardous waste.	40 CFR 262.11	\$300
Obtain identification number for treatment, storage, disposal, transportation, or offering for transportation.	40 CFR 262.12(a)	\$200
Confirm transporter or facility has an identification number.	40 CFR 262.12(c)	\$200
Prepare a manifest.	40 CFR 262.20(a)	\$400
Designate facility on manifest.	40 CFR 262.20(b)	\$200
Designate facility or instruct return of waste.	40 CFR 262.20(d)	\$200
Provide sufficient copies of the manifest.	40 CFR 262.22	\$200
Sign manifest certification by hand.	40 CFR 262.23(a)(1)	\$100
Obtain signature of initial transporter and date of acceptance on manifest.	40 CFR 262.23(a)(2)	\$100
Retain manifest.	40 CFR 262.23(a)(3)	\$100
Give transporter remaining copies of the manifest.	40 CFR 262.23(b)	\$300
Send required number of copies of dated and signed manifest for shipment by rail.	40 CFR 262.23(d)	\$200
Follow packing regulations.	40 CFR 262.30	\$400
Follow labeling regulations.	40 CFR 262.31	\$200
Follow marking regulations.	40 CFR 262.32(a)	\$200
Mark each container with required information.	40 CFR 262.32(b)	\$200
Follow placard regulations.	40 CFR 262.33	\$200
Follow hazardous waste accumulation regulations.	40 CFR 262.34(a)	\$1,000
Follow hazardous and acutely hazardous waste accumulation regulations.	40 CFR 262.34(c)(1)	\$300
Follow hazardous waste accumulation regulations.	40 CFR 262.34(d)	\$500
Accumulate no more than 6,000 kilograms of hazardous waste.	40 CFR 262.34(d)(1)	\$500
Retain a copy of the manifest.	40 CFR 262.40(a)	\$200
Retain a copy of reports.	40 CFR 262.40(b)	\$200
Retain a copy of records.	40 CFR 262.40(c)	\$200
Determine status of waste.	40 CFR 262.42(a)(1)	\$100
Submit exception report.	40 CFR 262.42 (a)(2)	\$100

173. The site where the source was used would be surveyed in accordance with the requirements of 10 CFR 30.36. The source would be shipped to a radioactive waste disposal facility licensed by the U.S. Nuclear Regulatory Commission (NRC) or a state delegated this authority by the NRC.

### **9.11 Noise Requirements**

Chapter 8.04 of the Storey County Code limits maximum noise levels at the facility boundary to 84 dB in the frequency range between 500 and 1,800 Hz. Nuisance noise is also prohibited.

Near-field or in-plant noise levels would be controlled by specifying that equipment could not produce a noise level that exceeded 85 dBA at *0.9 meters (3 feet)* from the equipment. Generally, this practice would permit compliance with OSHA noise exposure regulations (29 CFR 1910.95) without hearing protection in many parts of the plant. Some areas still would need to be identified as a high noise level area and hearing protection would be required.

However, there are no Federal noise standards that govern noise impacts on surrounding communities. EPA has produced noise guidelines applicable to rural residences; these guidelines do not consider cost or feasibility and have no regulatory authority, but they do provide a reference point for assessing impacts. The state of Nevada has no environmental noise regulations.

### **9.12 Pollution Prevention Requirements**

The Pollution Prevention Act of 1990 establishes an environmental hierarchy, with pollution prevention/source reduction as the most desirable environmental management option. If pollution cannot be prevented then, in descending order of preference, environmentally sound recycling, treatment, and disposal are listed as alternative risk management options.

## 10. REFERENCES

### 10.0 Summary of Changes Since the DEIS

*The list of references has been updated to reflect additional references used.*

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Education: Ph.D., Biology/Chemistry  
M.S., Biology/Chemistry  
B.S., Biology/Chemistry  
Years of Experience: 25  
Certification:  
Total Publications: 18

**Michele Vuotto**

Title: Staff Scientist, Water and Ecological Programs Department, Dynamac Corporation  
Technical Responsibility: Technical Writing  
Education: B.S., Biology, University of Maryland, 1988  
Years of Experience: 4  
Certification:  
Total Publications:

**Jan K. Wachter, Sc.D., CIH**

Title: Director, Environmental Safety and Health Program Support Division, Morgantown Energy Technology Center  
Technical Responsibility: METC NEPA Overall Coordination; QA/QC  
Education: Sc.D., 1982, Environmental Health (Water Chemistry)  
MBA, 1991, Business Administration  
M.S., 1977, Water Supply and Pollution Control Engineering  
B.S., 1976, Biology/Chemistry  
Years of Experience: 20  
Certification:  
Publications:

**Steven C. Wood**

Title: Geographer, Army Corps of Engineers  
Technical Responsibility: Technical Review  
Education: B.A., University of Pittsburgh  
Years of Experience: 4  
Certification:  
Total Publications:

**Bruce Zike, CIH**

Title: Regional Manager, Health and Safety, Sacramento Office, Dynamac Corporation  
Technical Responsibility: Reviews (Health, Safety, and Noise)  
Education: M.S., 1985, Occupational Environmental Health, University of California  
B.S., 1979, Environmental Studies, University of California  
Years of Experience: 11  
Certification: Certified Industrial Hygienist (ABIH)  
EPA-Certified Response Manager  
AHERA-Certified Asbestos Inspector  
Registered Environmental Health Specialist  
Total Publications:

## 12. LIST OF AGENCIES AND INDIVIDUALS CONTACTED

### 12.0 Summary of Changes Since the DEIS

*The list of agencies and individuals contacted has been updated to reflect consultations that took place since the Draft EIS.*

_____	Washoe County Regional Planning Commission.
_____	Nevada Bureau of Mines and Geology, University of Nevada, Mail Stop 178, Reno, NV 89557.
_____	Soil Conservation Service, Reno Field Office, 1201 Terminal Way, Ste. 222, Reno, NV 89502.
_____	Carbon Dioxide Information and Analysis Center (CDIAC) at Oak Ridge National Laboratory, April 3, 1994.
_____	<i>Nevada Highway Patrol, Commercial Sargeant's Office.</i>
_____	<i>Federal Railroad Administration, Hazardous Materials Transportation Division</i>
Able, Bill	City of Reno Licensing Department, May 17, 1993.
Adams, Tom	U.S. Army Corps of Engineers, Sacramento District 1325 J Street, Sacramento, CA 95814-2922.
Anderson, John	LaRoche Industries Inc. IL.
Anvari, Carol/Assistant Director of Statistics Analysis and Reporting	Southern Pacific Railroad, July 19, 1993.
Argenti, Rita	Sheet Metal Workers Local 26. May 17, 1993.
Baker, Bob	United States Environmental Protection Agency, Region 9. 215 Fremont Street, San Francisco, CA 94105.
<i>Bart, Herbie</i>	<i>Southern Pacific Transportation, Hazmat Group.</i>
Baxley, Randy	Reno Planning and Community Development. January 7, 1993.

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Benoit, Chris	U.S. Forest Service, Air Resources Division, Federal Building, 324 25th Street, Ogden, UT 84401.
<b><i>Berry, Bob</i></b>	<b><i>Nevada Bureau of Emergency Management.</i></b>
Buchanan, Chester/Assistant Field Supervisor	Ecological Services, U.S. Fish and Wildlife Service, 4600 Kietzke Lane, Building C, Suite 125, Reno, NV 89502.
Burns, Ken	Englehard Corporation, 101 Wood Avenue, Iselin, NJ 08830-0770.
Campobenedetto, Ed/Manager, Environmental Projects	Babcock & Wilcox, Environmental Equipment Division, 20 S. Van Buren Avenue, P.O. Box 351, Barberton, OH 44203-0351.
Chexley, Matt	Desert Research Institute.
Cienynsti, Rich	Ironworkers Local 118. May 14, 1993.
Coady, Frank	State of Nevada, Emergency Management Division, 2525 S. Carson Street, Carson City, NV 89710.
Coffin, Pat/Senior Staff Biologist	Ecological Services, U.S. Fish and Wildlife Service, 4600 Kietzke Lane, Building C, #125, Reno, NV 89502.
Cooper, Kevin/Data Manager	Nevada Natural Heritage Program, 123 West Nye Lane, Room 168, Carson City, NV 89710.
Cooper, Jim	Nevada Department of Environmental Protection.
<b><i>Davis, Alan</i></b>	<b><i>Pennsylvania State University, Coal Research Section.</i></b>
Curtis, Bob	Plaster & Cement Local 241. May 21, 1993.
dePolo, Diane	Seismological Laboratory, University of Nevada, Reno, NV 89557. Telephone conversation dated March 26, 1993.
DelCarlo, Robert/Sheriff	Virginia City Sheriff's Department. June 21, 1993.
Fells, Carla/Business Licence Compliance Officer	Washoe County Development Review Department, Reno, NV.
<b><i>Finklebinder, Dave</i></b>	<b><i>National Coal Institute.</i></b>
Franchi, Mark/Manager	Lockwood Landfill, April 4, 1994; <b><i>July 15, 1994.</i></b>

Gallegher, Tom	Nevada Department of Water Resources.
<i>Geselbracht, Jeanne</i>	<i>United States Environmental Protection Agency, Region 9, August 15, 1994.</i>
Goicoa. Agent at Sparks	Southern Pacific Railroad. May 12, 1993, June 2, 1993.
Gonzales, John/Sanitary Engineer	Truckee Meadows Water Reclamation Facility. May 28, 1993.
Goodrich, Andy	Washoe County Division of Air Quality, AQMD.
Greybeck, Marsha	NDEP, Bureau of Water Pollution Control.
Gushen, Karin	Fernley Chamber of Commerce, February 1, 1993.
Hamlin, Robin/Fish and Wildlife Biologist	Ecological Services, U.S. Fish and Wildlife Service, 4600 Kietzke Lane, Building C, #125, Reno, NV 89502.
Harlow, David/Field Supervisor	Nevada Field Office, U.S. Fish and Wildlife Service, 4600 Kietzke Lane, Building C, #125, Reno, NV 89502.
Haymore, Dean	Storey County Building Department, Virginia City, NV.
Heneghan, Doug/Applications Engineer	Norton Chemical, Process Products Corporation, P.O. Box 350, Akron, OH 44309-0350.
Herman, Cynthia/Planner	Washoe County Department of Comprehensive Planning.
Hoffman, Cecil	Labor Local 169. May 14, 1993.
Ivanusich, J.G./Field Engineer	Southern Pacific Railroad. June 2, 1993.
James, Alvin/Tribal Chairman	Pyramid Lake Paiute Tribe, P.O. Box 256, Nixon, NV 89424.
<i>James, Darryl</i>	<i>Nevada Department of Transportation, Environmental Section.</i>
Jessie, Fred	Nevada Water Planning Department. March 3, 1993, May 7, 1993.
Jones, Wendy	Electrical Workers Local 401. May 14, 1993.
Kolton, Bill/Superintendent	Storey County School District. June 1, 1993.
Kraus, Greg	Reno Regional Transportation Commission. April 16, 1993.

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<b><i>Kulbacki, Michael/Railroad Inspector</i></b>	<b><i>Public Service Commission of Nevada.</i></b>
Kuregar, George	LaRoche Industries Inc. Atlanta, GA.
<b><i>Lindermann, Charles</i></b>	<b><i>Edison Electric Institute.</i></b>
Leyse, Karen	U.S. Forest Service, Pacific Ranger Station, Pollock Pines, CA 95726.
Maki, Keith/Assistant Director	Nevada Department of Transportation.
Manning, David	Traffic Division, Nevada Department of Transportation.
McCleary, Gay/Supervisor of Permitting Branch	Bureau of Air Quality, Nevada Division of Environmental Protection, Carson City, NV.
McQuivey, Robert/Chief	Habitat Division, Nevada Department of Wildlife, P.O. Box 10678, Reno, NV 89520-0022.
Miller, Jane/Director	Care Flight. June 2, 1993.
Moerdyke, Don	Unocal Chemicals Division/Nitrogen Group. 1201-T W. Fifth Street, Los Angeles, CA.
Murdock, Bob	Nevada Employment Security Department. December 11, 1992, March 17, 1993.
Olsen, Al	U.S. Bureau of Reclamation. March 16, 1993.
Orphan, Paul/Registered Engineer	Washoe County Public Works, Utilities Division. May 28, 1993.
Owen, Coe	EPA, Region 9, Air and Toxics Division.
Palmer, John	Storey County Building Department. April 4, 1994.
Pasloff, Dr./State Superintendent	Nevada Public Schools. July 12, 1993.
Porter, Josie	Plumbers & Fitters Local 350. May 14, 1993.
Price, Judy/Fire Marshal	Truckee Meadows Fire Department. May 17, 1993.

Proctor, Trent	U.S. Forest Service, Sequoia National Forest, 900 W. Grand Avenue, Porterville, CA 93257-2035.
Remer, Greg	Nevada Division of Environmental Protection, 201 South Fall Street, Carson City, NV 89710.
Riolo, Rich	Nevada Division of Forestry. May 17, 1993.
Robertson, Jack	Ferguson Industries. 1900 W. Northwest Highway, Dallas, TX 75220.
Rosenstein, Abe	Englehard Corporation, 101 Wood Avenue, Iselin, NJ 08830-0770.
Roth, Chris	Washoe County Division of Air Quality.
<i>Sanderson, Lee</i>	<i>Nevada Department of Transportation, Railroad Station.</i>
Sargeant, Sandy	Western Nevada Agency of the Bureau of Indian Affairs. December 11, 1992.
Scoppettone, Gary/Fish Ecologist	National Fisheries Research Center, U.S. Fish and Wildlife Service, 4600 Kietzke Lane, Building C, Suite 120, Reno, NV 89502.
Sczudlo, Gerard/Senior Sales Engineer	Johnson Matthey, Catalytic Systems Division, Environmental Products, 460 East Swedesford Road, Wayne, PA 19087-1880.
Sevon, Mike/Regional Supervising Fisheries Biologist	Fallon Regional Office, Nevada Department of Wildlife, 380 West B Street, Fallon, NV 89406.
Smith, Robert E.	Nevada Bureau of Air Quality, Carson City.
Stephenson, Nancy	Cormetch, Inc., Environmental Technologies, 5000 International Drive, Durham, NC 27712.
<i>Strekal, Tom</i>	<i>Bureau of Indian Affairs, August 19, 1994.</i>
<i>Stone, Gary</i>	<i>Federal Water Master.</i>
Tingley, Joseph	Mackay School of Mines.
Turner, Steven/Manager, Sales and Marketing	Norton Chemical, Process Products Corporation, P.O. Box 350, Akron, OH 44309-0350.

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Van Bruggen, Bill	Nevada Bureau of Mines and Geology.
Vareha, Jack	LaRoche Industries Inc. NJ.
Vogelsong, Tarisa	U.S. Geological Survey.
Wagner, Paul/Fisheries Biologist	Pyramid Lake Fisheries, Pyramid Lake Paiute Tribe, Star Route, Sutcliff, NV 89510.
Warren, Mark/Fisheries Biologist	Fallon Regional Office, Nevada Department of Wildlife, 380 West B Street, Fallon, NV 89406.
<i>Watterman, Randy</i>	<i>Nevada Department of Transportation, Risk Management Group.</i>
Welsh, Allan	U.S. Geological Survey.
Whitney, Bill/Planner	Washoe County Department of Comprehensive Planning.
Wiggins, Dana	Carpenters Local 971. May 14, 1993.
Wythes, Thomas	MacKay School of Mines, University of Nevada, Reno, NV 89557, written communication dated April 25, 1993.

# **13. LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE STATEMENT ARE SENT**

## ***13.0 Summary of Changes Since the DEIS***

*This list has been updated to reflect actual distribution of the Draft EIS and requests received for copies of the Final EIS. All individuals on the revised list will receive a copy of the Final EIS.*

### **FEDERAL GOVERNMENT AGENCIES**

U.S. Department of Agriculture  
Forest Service  
Soil Conservation Service

U.S. Department of Energy  
Office of Clean Coal Technology

U.S. Environmental Protection Agency  
Region IX, San Francisco, California  
Region X, Seattle, Washington

U.S. Department of the Interior  
Bureau of Land Management  
Bureau of Reclamation  
Fish & Wildlife Service  
*Bureau of Indian Affairs*

Office of Management and Budget

*U.S. Army Corps of Engineers*

### **CONGRESSIONAL REPRESENTATIVES**

Representative Phil Barnett  
Senator Max Baucus  
Representative James Bilbray  
Representative Michael Bilirakis  
Representative Thomas Bliley

**CONGRESSIONAL REPRESENTATIVES (continued)**

Representative George E. Brown, Jr.

Senator Richard Bryan

Senator Robert C. Byrd

Senator John H. Chafee

Representative John D. Dingell

Senator Pete V. Domenici

Representative Harris Fawell

Senator Wendell H. Ford

***Senator John Glenn***

Senator Mark O. Hatfield

Senator J. Bennett Johnston

Representative Marilyn Lloyd

Representative Joseph M. McDade

Representative Carlos Moorhead

Senator Don Nickles

Representative David R. Obey

Representative Ralph Regula

Senator Harry Reid

***Senator William V. Roth, Jr.***

Representative Philip R. Sharp

***Representative Barbara Vucanovich***

Representative Robert S. Walker

Senator Malcolm Wallop

Representative Henry A. Waxman

Representative Sidney R. Yates

**NEVADA STATE GOVERNMENT AGENCIES**

Governor Robert J. Miller

Attorney General's Office

Commission on Economic Development

Public Service Commission - Nevada

**NEVADA STATE GOVERNMENT AGENCIES (continued)**

*Department of Administration*

*Division of Environmental Protection*

*Department of Comprehensive Planning*

Department of Conservation and Natural Resources

Division of Historic Preservation and Archeology

Nevada Division of Water Resources

Division of Wildlife

State Senators and Representatives

Earnest E. Adler

Virgil M. Getto

Diana M. Glomb

Lawrence E. Jacobsen

Harry Reid

**NEVADA COUNTY/REGIONAL AGENCIES**

Churchill County

*Douglas County*

*Elko County*

*Eureka County*

*Humboldt County*

*Lander County*

Lyon County

*Pershing County*

Storey County

Truckee Carson Irrigation District

Truckee Meadows Regional Planning Agency

Washoe County

*White Pine County*

**CITY GOVERNMENT**

City of Carson

City of Fallon

*City of Fernley*

City of Reno

City of Sparks

**ASSOCIATIONS AND ORGANIZATIONS/INDUSTRY AND UNIONS**

Associated General Contractors of America, Inc.

Audubon Society

*BC Benmol Corporation*

Brady Power Partners

Building & Construction Trades Council of Northern Nevada, AFL-CIO

Caithness Resources Inc.

*Cansbridge Information Group*

Carpenters Local 971

Citizen Alert

*Clean Fuels Report*

Coeur d'Alene Mines

*Corporation Information Center*

*Council on Alternative Fuels*

Duraflex International Corp.

*Dynamac Corporation*

Eagle-Picher Minerals, Inc.

EDAWN

*Electric Power Research Institute*

Environmental Defense Fund

Environmental Policy Institute

Foster-Wheeler USA

*FOXX Systems*

Hale Day Gallagher Co.

Insulators & Asbestos Workers, Local 16

**ASSOCIATIONS AND ORGANIZATIONS/INDUSTRY AND UNIONS (continued)**

International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers & Riggers

International Brotherhood of Boilermakers, Local 549

International Brotherhood of Electrical Workers, Local 401

*Iron Workers #118*

*Jacobs Engineering*

*James Kent Association*

*JBR Environmental*

Laborers' International Union of North America, AFL-CIO, LU169

Lands of Sierra

League of Women Voters

M. W. Kellogg Co.

National Fish & Wildlife Foundation

National Parks & Conservation Association

National Wildlife Federation

Natural Resources Defense Council

Nature Conservancy

Nevada Conservation League

Nevada Natural Heritage Program

Painters & Allied Trades, Local 567

Plumbers and Pipefitters, Local 350

Public Resource Associates

Pyramid Lake Tribal Council

R.R. Donnelley & Sons Co.

*SaskPower*

Sheet Metal Workers International, LU26

Sierra Club

Sierra Energy and Risk Assessment

Sierra Pacific Power Co.

*TAD's*

*Tetra Tech, Inc.*

*The Land Water Fund*

Utility Shareholders Association of Nevada

**ASSOCIATIONS AND ORGANIZATIONS/INDUSTRY AND UNIONS (continued)**

*Union Bank of Switzerland*

*Water Research & Development, Inc.*

Western States Geothermal

Westpac Utilities

*Westtec Engineering*

**INDIVIDUALS**

*Steve Alastuey*

Robert Anderson

*Erica Atkeson*

*Larry Beck*

Ned Bliss

Barry Bouchard

*Bradley Bryant*

Vivian Christensen

Krestine M. Corbin

Juanita Cox

George Crawford

*James D. Davis*

Harold P. Dayton, Jr.

T.L. Dinnde

Maurice Eben

Norma C. Elliott

George Foster

Richard Fulstone

Mr. Hansen

*Clyda Harttine*

Gayla Higgins

Colleen Hillman

*Rick Jameson*

*Jennifer Jones*

**INDIVIDUALS (continued)**

Mr. and Mrs. Paul Keife

*Steve King*

Peter Lenz

Bob Lopes

James Lopez

*Monte Martin*

*Robert K. Martinez*

Sister Margaret McCarran

Ruth L. Miller

James L. Murphy

Gerald Myers

Jerry Myers

*Alan Parolini*

Donald K. Remington, Ph. D.

Marge Sills

Rod Sloan

Melissa Smith

Mike Stewart

*Paul Stieger*

*Sandra S. Theisen*

*Carl Trinlc*

Philip Trowbridge

*Peter S. Tuttus*

Robert B. Whittington

Alyce T. Williams

*John Williams*

*Harry E. Wilson*

**READING ROOMS**

Lyon County Fernley Branch Library

Washoe County Public Library

**Piñon Pine Power Project**

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**READING ROOMS (continued)**

Department of Energy, Freedom of Information Public Reading Room

Department of Energy, Morgantown Energy Technology Center

Sierra Pacific Power Company

Storey County Library

## 14. GLOSSARY

### 14.0 Summary of Changes Since the DEIS

*The glossary has been amended to add new terms used and to clarify definitions.*

Acid deposition:	A complex chemical and atmospheric phenomenon that occurs when emissions of sulfur and nitrogen compounds and other substances are transformed by chemical processes in the atmosphere, often far from the original sources, and then deposited on earth in either a wet or dry form. The wet form, popularly called "acid rain", can fall as rain, snow, or fog. The dry forms are acidic gases or particulates.
<i>Acid neutralizing capacity (ANC):</i>	<i>The equivalent capacity of a solution to neutralize strong acids.</i>
Acid rain:	Precipitation with a pH less than 5.6. "Acid rain" is primarily a result of sulfuric acid and nitric acid produced in the atmosphere by the oxidation and hydrolysis of precursor sulfur dioxide and oxides of nitrogen that have been released during the combustion of fossil fuels. Other anthropogenic and natural chemical sources play a lesser role. Acid rain is considered to be detrimental to plant and aquatic life, and materials.
Acidification:	A process in which a water body or substrate becomes increasingly acidic because of additions of pollutants or naturally occurring chemical compounds.
Acre-foot (AF):	A volume of water one foot deep and one acre in area, or 43,560 cubic feet. One acre-foot is equal to 325,850 gallons.
Adsorption:	Assimilation of gas, vapor, or dissolved matter by the surface of a solid or liquid.
Agglomerate:	The fusing together of small particles to form larger particles.
Air contaminant:	Any particulate matter, gas, or combination thereof, other than water vapor or natural air, capable of being airborne.
Alluvium:	Material, such as sand, silt, or clay, deposited on land by streams.
Alternate fuels:	Natural gas, propane, distillate oil (No-Action alternative only).
Ambient air:	Any unconfined portion of the atmosphere: open air, surrounding air.

Ammonia (NH <sub>3</sub> ):	A colorless, gaseous alkaline compound, with a characteristic pungent odor, formed as the result of the decomposition of most nitrogenous organic material.
<i>Ammonia slip:</i>	<i>The portion of ammonia that exits unreacted from post-combustion NO<sub>x</sub> control devices, which utilize ammonia injection (into flue streams) to reduce the amount of thermal NO<sub>x</sub> generated.</i>
Andesite:	Mineral consisting of silicate of calcium, magnesium, and iron in fine grained volcanic rock.
Anoxic:	Lack of oxygen.
Anthropogenic:	Referring to the impact of humans on nature.
Aquifers:	An underground geological formation or group of formations, containing usable amounts of groundwater that can supply wells and springs.
Archaeology:	The scientific study of the life and culture of ancient peoples as by excavation of ancient cities, relics, and artifacts.
Artifacts:	A primitive object made by human work (e.g., tool, weapon, vessel).
Ash:	All mineral matter left after the complete combustion of fuel.
Atmospheric Dispersion Model:	Computer program that simulates the effect or spread of pollutants into the atmosphere from a source such as a power plant.
Atmospheric pressure:	The pressure at any point in an atmosphere due solely to the weight of the atmospheric gases above the point concerned (also known as barometric pressure).
Attainment area:	An area considered to have air quality as good as or better than the National Ambient Air Quality Standards as defined in the Clean Air Act. An area may be an attainment area for one pollutant and a non-attainment for others.
Attraction flows:	Adequate water flows to provide sufficient water and temperature consistent with spawning needs.

Best Available Control Technology (BACT):	An emission limitation based on the maximum degree of emission reduction which (considering energy, environmental, and economic impacts, and other costs) is achievable through application of production processes and available methods, systems, and techniques. BACT does not permit emissions in excess of those allowed under any applicable Clean Air Act provisions.
Basalt:	A rock of volcanic origin composed largely of feldspar and dark minerals such as pyroxene and olivine.
Baseline conditions:	Existing conditions used to establish a baseline from which to evaluate potential impacts.
Baseload:	Generating plants running a majority of the time, and at full capacity output approximately 70 % of that time or greater.
Binders:	A resin or cement-like material used to hold particles together and provide mechanical strength.
Biodiversity:	The sum total of all the plants, animals, fungi, and microorganisms in an area and all the interactions between them.
Bituminous coal:	Coal that burns freely because of a relatively high hydrocarbon content; generally having a low ash and moisture content.
Bloodborne pathogens:	Pathogenic microorganisms that are present in human blood and can cause disease in humans.
Blowdown water:	Water removed from a process so fresh make-up water can take its place to maintain necessary water purity.
Boiler:	Equipment (vessel) in which water is converted to steam.
Breccia:	A rock made of very angular coarse fragments; may be sedimentary or formed by grinding or crushing along faults.
Breeze:	<i>Devolatilized coal (coal devoid of volatile matter).</i>
British thermal unit (Btu):	A unit of heat energy that will warm one pound of water one degree Fahrenheit at sea level pressure.
<b>Buffering:</b>	<b><i>The ability to resist change in pH when acids or alkalies are added.</i></b>
Calcareous tufa:	Porous stone containing calcium.

Calcination:	Chemical reaction that uses heat to remove carbon dioxide from calcium carbonate forming calcium oxide (lime); decomposition.
Calcining:	The process of "burning" a material such as limestone (calcium carbonate) to form calcium oxide (lime).
Candle filter:	A porous ceramic filter that removes particles from the gasifier product gas.
Capacity:	The maximum load a generator, turbine, power plant, transmission circuit, or power system can supply under specified conditions for a given period of time without exceeding approved limits of temperature and stress. Synonymous with Capability.
Carbon dioxide (CO <sub>2</sub> ):	A colorless, odorless, non-poisonous gas which results from fossil fuel combustion and is part of ambient air.
Carbon monoxide (CO):	A colorless, odorless, poisonous gas produced by incomplete fossil fuel combustion.
Char:	A porous solid product containing 85-98% carbon and produced by heating carbonaceous materials such as cellulose, wood, or peat at 500-600°C in the absence of air; also known as charcoal.
Chelating:	To cause a metal ion to react with another molecule to form a closed chain.
Chemical Emergency Response Plan:	Plan that provides procedures for incidents, such as fires and explosions, including an evacuation plan and first aid procedures.
Chemical Hygiene Program:	Program that includes standard operating procedures relevant to health and safety considerations and criteria to be used for determining and implementing control measures to reduce employee exposure to hazardous chemicals.
Chert:	Fine-grained, tough rock composed of silica and occurring commonly in limestone beds.
Class 1 air basins:	Classification of attainment areas that include international parks, national wildlife areas, memorial parks larger than 5,000 acres, and national parks larger than 6,000 acres.
Class I landfill:	Landfill permitted to receive both municipal and non-hazardous industrial solid wastes.

Coal fines:	Small particles and dust from coal, usually less than 200 mesh.
Coke breeze:	Carbonaceous residue produced from the destructive distillation of coal in the manufacture of metallurgical coke.
Colluvial:	Pertaining to rock fragments and sand that accumulate on steep slopes or at the foot of cliffs.
Combined cycle:	The type of generating plant that burns fuel to generate electricity in one generator and recovers waste heat to produce steam which powers another generator.
Combustion turbine:	A machine similar to a jet engine connected to a generator.
Confined Space Entry Procedure:	Minimizes the potential impacts to workers performing work activities in confined or limited entry spaces.
Consumptive water rights:	Water consumed by users, and therefore not available for other uses.
Cooling pond:	Outdoor area (similar to a lake) into which hot process water is pumped for purposes of cooling.
Cooling water:	Water that is heated as a result of being used to cool the boiler.
Corrosive:	High risk of corrosion to uncoated steel or deterioration of concrete.
Criteria pollutants:	Pollutants for which national primary or national primary and secondary ambient air quality standards have been defined under section 109 of the Clean Air Act to protect public health and welfare. They include sulfur oxides (measured as sulfur dioxide); PM <sub>10</sub> (particulate matter with an aerodynamic diameter equal to or less than 10 microns); carbon monoxide; ozone; nitrogen dioxide; and lead.
<i>Cryogenic:</i>	<i>Of or relating to low temperatures.</i>
Cui-ui:	An endangered species of sucker fish that is native to Pyramid Lake.
Cyclones:	Funnel-shaped device for removing particles from air by centrifugal means.
Deaerator:	A device in which oxygen, carbon dioxide, or similar gases are removed from boiler feedwater <i>or</i> steam condensate.

## **Piñon Pine Power Project**

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Debitage:	An archaeological term referring to unused flakes and cores from the process of toolmaking.
Demand:	The instantaneous rate at which electric energy is delivered to or used by a system. Synonymous with Load.
Demand-side:	A term referencing a utility's plans to reduce customer consumption (e.g., energy-savings techniques).
De minimis:	The minimum amount of a substance resulting in regulation or exemption from regulation.
Design coal:	The specific type of coal around which the components of the Piñon project gasifier are sized and specified.
Dewatering:	The process of removing water especially in large-scale processing of sewage and chemicals.
Diatomite:	An industrial mineral and aggregate (silica)
Dispersion model:	A computer program that incorporates a series of mathematical equations used to predict ground-level concentrations resulting from emissions of a pollutant to the air.
Distillate fuel oil:	A petroleum product having a boiling range between 400°F (204°C) and 650°F (343°C).
Diversion:	Taking water from a stream or other body of water into a canal, pipeline, or other conduit.
Dosimeter:	An instrument that measures exposure to radiation.
Drawdown:	Lowering of the water level of a well or reservoir.
Drift:	Water lost in a cooling tower as mist or droplets entrained by the circulating air, not including the evaporative loss.
Droughts:	A prolonged period of dry weather; lack of rain.
Ecosystem:	The interacting system of a biological community and its nonliving surroundings.

Electric Power Research Institute (EPRI):	A non-profit corporation funded by member utilities to plan and manage research and development on behalf of the electric utility industry.
Emission:	Uncontrolled discharges into the atmosphere from smokestacks, other vents, and surface areas of commercial or industrial facilities; from residential chimneys, and from motor vehicle, locomotive, or air craft exhausts.
Emissivity:	The ability of a surface to radiate energy as compared to that emitted by a black surface under the same conditions.
Endangered Species:	Animals, birds, fish, plants, or other living organisms threatened with extinction by manmade or natural changes in their environment. Requirements for declaring a species endangered are contained in the Endangered Species Act.
Endothermic:	A reaction or process in which heat is absorbed.
<b>Enthalpy:</b>	<b><i>Heat content, a thermodynamic property of a substance.</i></b>
Environmental Information Volume (EIV):	A collection of data provided by the Industrial Participant prior to preparation of an Environmental Impact Statement.
Eolian:	Windblown or wind-deposited sediments
Epicenter:	The area of the earth's surface directly above the place of origin or focus of an earthquake.
Evaporation pond:	Area where wastewater from boiler and blowdown reject is allowed to evaporate.
Existing resources:	Those resources that are currently in use, or being developed under contract but not yet in operation.
Exothermic:	A reaction or process in which heat is released.
Fabric filter:	A device that removes dust and other finely divided particles by conveying the gas stream through porous fabric material and trapping the particles on the fabric surface.

## **Piñon Pine Power Project**

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Face value:	The amount of water available for use for municipal and industrial purposes following a conversion of agricultural water rights to municipal and industrial water rights.
Fault:	A surface or zone of rock fracture along which there has been displacement.
Federal Energy Regulatory Commission (FERC):	The division of the U.S. Department of Energy responsible for regulating power generation rates and charges for the transportation and sales of gas and electricity across state boundaries. FERC also licenses hydroelectric power plants.
Feed hopper:	Equipment that provides continuous feed of coal and limestone to the gasifier through the coal feeder.
Floodplains:	Highwater channels of rivers, streams, and lakes that may be covered with water on a seasonal or episodic basis.
Fluidized bed:	A mixture of crushed coal and limestone kept in suspension by the action of gases forced through the mixture.
Fluidized bed sulfator:	Unit in which the calcium sulfide (CaS) would be oxidized to form calcium sulfate (CaSO <sub>4</sub> ).
Fluvial:	Beds of deposited river materials produced by stream action.
Forb:	A broad-leaved flowering plant.
Fossil fuels:	Coal, oil, natural gas and other fuels derived from fossilized geologic deposits.
Fugitive emissions:	Material such as coal dust that escapes from conveyors and handling equipment.
Gasifier:	The vessel in which coal is processed into burnable gas.
Gasification:	The process of converting a liquid or a solid (e.g., coal) to a gas.
Geology:	The scientific study of the origin, history, structure, and processes of the earth.
Gleying:	Showing a tendency to stick together and compact.

Global warming:	Concept of a worldwide increase in climatic temperatures due to various human- or environment-induced occurrences that increase greenhouse gases (e.g., carbon dioxide) in the atmosphere. It is believed by many that the increase in greenhouse gases allows light from the sun's rays to heat the earth but prevents a counterbalancing loss of heat.
Grain:	A unit of weight approximately 1/16 gram.
Greenhouse gases:	Gases such as carbon dioxide, nitrous oxide, methane, and chlorofluorocarbons whose elevated levels in the atmosphere may be contributing to the warming of the atmosphere.
Groundwater recharge:	The addition of water to the ground water system by natural or artificial processes.
Gypsum:	A widely distributed mineral consisting of hydrous calcium sulfate that is often used as a soil amendment and in making plaster of paris.
Habitat:	The sum of environmental conditions in a specific place that is occupied by an organism, population, or community.
Hazard Communication Program:	Program developed to ensure that the hazards of all chemicals are evaluated and information concerning these hazards is transmitted to employees.
Hazardous:	Continuous risk of harm or failure caused by or related to a substance or situation.
Hazardous Air Pollutants:	Air pollutants which are not covered by ambient air quality standards but which, as defined by the Clean Air Act, may reasonably be expected to cause or contribute to irreversible illness or death.
Hearing Conservation Program:	Program that requires the use of hearing protectors at exposure levels at or above 85 dBA.
Heat recovery steam generator:	A boiler that utilizes the hot exhaust from the combustion turbine to produce steam
Hornblende andesite:	Mineral consisting of silicate of calcium, magnesium, and iron in fine-grained volcanic rock.
Hydric:	Pertaining to or characterized by moisture.

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Hydrocarbons:	One of a very large group of chemical compounds composed only of carbon and hydrogen; the largest source is from petroleum crude oil.
Impervious soil:	A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.
Inert material:	Substance that exhibits few or no active properties.
Integrated Gasification Combined-Cycle:	A generating plant employing both coal gasification and combined-cycle power generation.
Isolde soil:	Derived from windblown material.
Kilowatt (kW):	A measure of electrical power equal to 1,000 watts.
Kilowatt-hour (kWh):	A common unit of electric energy consumption. Power (measured in kilowatts) multiplied by the time of operation (measured in hours) equals kilowatt-hours. Ten 100-watt light bulbs burning for 1 hour use 1 kWh.
Knockout drum:	Removes any water condensed from air or gas during cooling.
Lacustrine:	Produced by or belonging to lakes.
LASH:	The spent limestone and coal ash mixture removed from the gasifier unit.
Lateral spreading:	A form of planar failure that occurs in both soil and rock masses.
Leaching:	Phenomenon by which chemical components of soil are removed by solution.
Lead (Pb):	A heavy metal that is hazardous to health if inhaled or swallowed.
Liquefaction:	Phenomenon by which loose saturated sands subjected to vibration lose shear strength and resistance to deformation.
Load forecast:	The predicted demand for electric power and energy for planning purposes.
Loam:	Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.
Lockhopper:	A pressure vessel (similar to an air lock) that allows variations in pressure in order to increase or decrease the pressure of the vessel contents.

Major Stationary Source:	Any of the 28 specified source categories that has a potential to emit 100 tons per year or more, or any other stationary source that has the potential to emit 250 tons per year or more of any air pollutant regulated under the Clean Air Act.
Mantle:	Cover.
Maximum Credible Earthquake (MCE):	The most serious earthquake that can be hypothesized from known geologic characteristics.
Megawatt (MW):	A measure of electrical power equal to one million watts.
Megawatt-hour (MWh):	A measure of electric energy equal to 1 megawatt of power supplied from an electric circuit for 1 hour.
Mils/kWh (Mils):	A monetary measure frequently used when referring to the cost of producing or conserving energy. One mil equals 1/10 of a cent.
Mitigation:	Minimizing or eliminating.
Monitoring wells:	Wells drilled to collect groundwater samples for the purpose of physical, chemical, or biological analysis to determine the amounts, types, and distribution of contaminants in the groundwater beneath the site.
Mottling:	Marked with blotches, streaks, and spots of different colors or shades.
National Ambient Air Quality Standards:	Air quality concentration standards established by EPA, under the Clean Air Act, to protect public health and welfare.
Negative pressure:	A way of expressing vacuum; a pressure less than atmospheric or the standard 760 mmHg.
Negotiated settlement:	A settlement of all or substantially all of the outstanding legal issues relating to operation of the Truckee River System through a negotiated agreement among the various parties including SPPCo., the Pyramid Paiute Indian Tribe, the State, and the Truckee Carson Irrigation District.
Newlands Project:	The project authorized pursuant to the Reclamation Act of 1902 for reclamation and irrigation of land in the Carson and Truckee River Basins.
Nominal:	The expected value associated with normal operations.

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Nonattainment area:	A geographic area which does not meet one or more of the National Ambient Air Quality Standards for the criteria pollutants designated in the Clean Air Act.
Non-consumptive water rights:	Water used by a number of entities; that is, water used by one entity is returned to the source for subsequent use.
Obsidian:	Hard, usually dark-colored or black volcanic glass with conchoidal fracture.
Oligotrophic:	Pertaining to a lake, lacking plant nutrients and usually containing plentiful amounts of dissolved oxygen without stratification.
Olivine basalt:	Rock of volcanic origin containing a mineral silicate of magnesium and iron.
Opacity:	The relative capacity of matter to obstruct the transmission of light.
Orr Ditch Decree:	The decree of the District Court of the United States in and for the District of Nevada dated September 8, 1944, allocating the waters of the Truckee River within the State of Nevada.
Oxides of nitrogen:	Product of combustion of fossil fuels whose production increases with the temperature of the process. It is a major contributor to acid deposition and the formation of groundlevel ozone in the troposphere. Expressed as $\text{NO}_x$ , where the "x" represents the varying number of oxygen atoms that will combine with one atom of nitrogen.
Ozone:	Unstable blue gas with pungent odor; an allotropic form of oxygen. Ozone is found in the stratosphere and the troposphere. In the stratosphere (the atmospheric layer beginning 10 to 25 miles above the earth's surface), ozone is a form of oxygen formed naturally which provides a protective layer shielding the earth from ultraviolet radiation's harmful health effects on humans and the environment. In the troposphere (7 to 10 miles above the earth's surface), ozone is a chemical oxidant and a major component of photochemical smog. Ozone can seriously effect the human respiratory system and is one of the most prevalent and widespread of all the criteria pollutants. Ozone in the troposphere is produced through complex chemical reactions of nitrogen oxides, hydrocarbons, and sunlight.
Palustrine:	Material deposited in a swampy area.

<i>Parasitic load:</i>	<i>The amount of energy deducted from the gross amount generated which is required to operate a particular electrical demand component (i.e., fans in dry cooling).</i>
Particulates:	Fine liquid or solid particles such as dust, smoke, mist, fumes, or smog found in air contaminants.
Peak:	The greatest amount of demand occurring during a specified period of time.
Peaking:	Generating units that operate only during system peaks or during emergencies, usually less than 20% of the hours in a year.
Petroglyphs:	A prehistoric rock carving.
pH:	A measure of acidity or alkalinity of a liquid or solid material.
Phytotoxic:	Poisonous to plants.
Pictographs:	A primitive picture or picture-like symbol representing an idea; hieroglyphic.
Piping:	Refers to the erosion of soils caused by groundwater flow when the flow emerges on a surface and carries particles of soil with it.
Pleistocene:	An epoch of geologic time of the Quaternary Period following the Tertiary and before the Holocene; also known as the Ice Age.
Pleistocene Kate Peak Formation:	Predominately intrusive and extrusive rocks composed of hornblende and pyroxene andesite.
Plume:	A visible or measurable discharge of a contaminant from a given point of origin; for example, a plume of smoke.
Point source:	A stationary location or fixed facility from which pollutants are discharged or emitted.
Potable water:	Water that does not contain objectionable pollution, contamination minerals, or infective agents and is considered satisfactory for domestic consumption.
Potential to emit:	The capability, at maximum design capacity to emit a pollutant after application of control equipment.

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Pounds per square inch absolute (psia):	The absolute thermodynamic pressure resulting from a force of 1 pound applied uniformly over an area of 1 square inch.
Pozzolan:	A finely ground burnt clay or shale resembling volcanic dust that is used in cement because it hardens under water.
Prevention of Significant Deterioration (PSD): PSD increments:	EPA program in which state and/or Federal permits are required that are intended to restrict emissions for new and modified sources in areas where air quality is in compliance with National Ambient Air Quality Standards.  The maximum increases to ambient pollution levels that may be incurred as a result of increased emissions from new or modified sources; applied to three different types of areas.
Public Service Commission of Nevada (PSCN):	The Nevada State regulatory body for public utilities.
Pulse-jet:	A type of compressorless jet engine in which combustion occurs intermittently, so that the engine is characterized by periodic surges of thrust.
Purveyor:	Supplier.
Putrescible:	Any solid waste that is able to rot quickly enough to cause odors and attract flies, and is capable of attracting or providing food for birds and other vectors.
Respiratory Protection Program:	Program developed to control occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors.
Richter Scale:	A logarithmic scale ranging from 1 to 10; used to measure the magnitude of earthquakes.
Riparian:	Areas adjacent to rivers and streams that have a high density, diversity, and productivity of plant and animal species relative to nearby uplands.
Riverine:	Formed by or relating to a river.
Roentgen:	A measurement of gamma-radiation named after Wilhelm Konrad Roentgen.

Roentgen equivalent man (REM):	The unit dose of ionizing radiation that gives the same biological effect as that resulting from one roentgen of x-rays.
Saralegui-Isolde Association:	Soil consisting of alluvium that occurs on lake-plain terrace and alluvial fans.
Shrink-swell potential:	The shrinking of soil when dry and the swelling when wet.
Sierra Nevada Frontal Fault Zone:	A series of north-south trending faults, separating the Sierra Nevada from the Great Basin.
Sierra Nevada Tectonic Province:	A region characterized with high mountains and heavy winter snow.
Significant impact levels:	Under PSD regulations, the emission concentrations used to define the area potentially affected by the pollutant emissions from a new source and to determine the level of air quality analysis required.
Siltation:	The process by which fine particles of soil or rock are picked up by air or water and deposited as sediment.
Slope:	A measurement of the inclination of the land surface from the horizontal; for example, a slope of 10 percent is a drop of 10 feet in 100 feet of horizontal distance.
Solid waste:	All putrescible and non-putrescible refuse in solid or semi-solid form including but not limited to garbage, junk vehicles, ashes, incinerator waste, commercial or industrial waste (as defined by county ordinance).
Solvents:	Usually a liquid substance capable of dissolving or dispersing one or more other substances.
Sorbent:	A material that will remove most sulfur remaining in the hot gas produced by the gasification process.
Standards:	Prescriptive norms which govern action and actual limits on the amount of pollutants or emissions produced.
Start-up heater:	A natural gas-fired or propane-fired heater.
Steam blowing:	Activity conducted during the clean-up phase just prior to full start-up.

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Steam plant tagging rules:	Program instituted to control the potential for exposure to the release of hazardous energy for all work conducted on rotating or reciprocating equipment, boiler or unit outages, and electrical equipment.
<i>Stoichiometric:</i>	<i>Pertains to the numerical relationship between reactants and products in chemical reactions.</i>
Stratigraphy:	The arrangement of rocks in layers or strata.
Sulfator:	The equipment that oxidizes the LASH from the gasifier and converts calcium sulfide to calcium sulfate.
Sulfur dioxide (SO <sub>2</sub> ):	A heavy, pungent, gaseous air pollutant formed primarily by industrial fossil fuel combustion processes.
Supply side:	A term referencing a utility's plans to meet customer needs with sources of energy.
Surface water:	All waters naturally open to the atmosphere (rivers, lakes, reservoirs, streams, impoundments, seas, estuaries).
Tectonic:	Changes in the structure of the earth's crust; the forces responsible for such deformation or the external forms produced.
Topography:	The physical features of a surface area including relative elevations and the position of natural and man-made features.
Total dissolved solids:	Disintegrated organic and inorganic material contained in water. Excessive amounts make water unfit to drink or use in industrial processes.
Toxic:	Of, relating to, or caused by a poison or toxin.
Tramp iron:	Unwanted metal.
Truckee Meadows:	The hydrographic basin described by the State Engineer's Office which contains the area surrounding the cities of Reno and Sparks and which is tributary to the Truckee River.
Truckee River Basin:	The area which naturally drains to the Truckee River, its tributaries, and into Pyramid Lake (inclusive), but excluding the Lake Tahoe Basin.
Tuff breccia:	Consolidated volcanic ash, composed largely of fragments.
μmhos/cm:	A standard unit of measure for conductivity.

Uniform Building Code Zone 4:	Code that ensures structures are designed and constructed to resist the effects of potential seismic ground motion and wind speeds; the most stringent requirements apply.
Walker Lane Fault Zone:	A 20-mile wide, northwest trending zone of mainly right lateral faults extending from near Walker Lake northwest through Pyramid Lake and into the Modoc Plateau of California.
Water right:	A right to use water for beneficial purpose granted under State or Federal law or court decree.
Watershed:	The surface drainage area and subsurface soils and geologic formations that drain to a particular body of water.
Watt (W):	A basic unit of electric power. One watt is equal to 0.00134 horsepower or 0.73756 foot-pounds per second (the energy necessary to move 1 pound the distance of 0.73756 feet in 1 second).
Wetland:	An area that is regularly saturated by surface or groundwater and subsequently is characterized by a prevalence of vegetation that is adapted for life in saturated soil conditions.
Zero discharge:	Refers to the lack of wastewater from a plant discharged into a waterbody.

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